# THE MODEL ENGINEER

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EXHIBITION NUMBER

# The MODEL ENGINEER

*PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2*

18TH AUGUST 1949 VOL. 101 NO. 2517



# SMOKE RINGS

## Some Exhibition Thoughts

● WHEN THESE notes appear in print, the "M.E." Exhibition, to give it its familiar title will be in full swing once mote. Doubtless, many of our visitors will be comparing it with those of past years and forming their own opinions about it. Every year, many people tell us that the show is not as good as it used to be, and just as many opine that it is the best show yet! And others still, for reasons best known to themselves, will express opinions that come somewhere between the two extremes.

We always enjoy these comments because only through them are we able to note what has particularly struck our visitors, and so learn our lessons. From every show there are lessons to be learned, some of which may suggest improvements in the future, while others may confirm that our plans were right.

This year, we think our visitors will notice the changes in the general arrangement of the stands and the demonstration arena; also that the main gangways all radiate from the arena. These changes have not been easy to make, but we feel they have been worth doing on account of the greater convenience they provide; it is easier for people to circulate through the hall, and this aids the social intercourse that is such a prominent feature of the show.

Mention of the social side brings to mind the fact that, ever since it was first held, the "M.E." Exhibition has been a rallying point for model engineers from all over Britain and from overseas. At no other function of its kind is such a family-party feeling more apparent, and we like to think that our show first set the pace in this direction. But whether we are right or not in this idea, we always make a special point of doing everything possible to foster the friendly spirit, because it pervades all gatherings where model engineers meet up and down the country, and is one of the firmest of the foundations upon which our hobby rests.

After the six-years' enforced pause during the war, the revival of our show was almost bound to be accompanied by little difficulties, comparable with the inherent stiffness of a machine that has lain idle for a long time; but these have now been overcome and everything works smoothly and certainly, from year to year.

## "M.E." Exhibition Trade Stands

● A GLANCE through the list of firms who are represented at the "M.E." Exhibition, this year, reveals that there are no fewer than thirty-four firms there, and that is very satisfactory.

People have sometimes made complaints that the "M.E." Exhibition is essentially a trade show; but that idea must be based upon some curious misunderstanding, because it is just not true.

The sole object of the exhibition is to present our hobby, in all its aspects, to, not only model engineers, but the general public; and that, surely, is no cause for complaint. The public is made acquainted with the fact that there is much that is useful in our hobby, and our visitors see for themselves that the cult of model engineering has given rise to at least a national, if not a basic, industry. That industry is not, as yet, a rich one, from the financial angle, and it has to struggle against difficulties and restrictions which

are not of its own making. But none, except the most uninitiated of onlookers, can deny that the industry has, whenever the occasion has demanded, risen nobly to the situation and proved its worth as a national asset.

Therefore, to exclude the trade from the "M.E." Exhibition would be a gross folly, since to do so would mean that, from the point of view of the man-in-the-street, we should be presenting him with only half the picture; and in these circumstances, he would have a genuine cause for complaint.

So we invite the trade to take part in our exhibition, not only for the reasons given above, but also because we wish to encourage people to take up our hobby; and they will do so more readily if they can be shown what is available on the market, in the way of tools, castings, parts, materials and even completed models.

### The Fascination of Steam

● IT IS an interesting and an incontrovertible fact that, in the pre-"M.E." Exhibition correspondence—and there was plenty of it!—from enquirers about some phase or other of the show, many people express hopes that there will be heaps of locomotives, or steamboats or traction engines to be seen; steam engines of most kinds, and even steam turbines were occasionally mentioned, but never electric or petrol traction models, though the petrol engine, pure and simple, is quite a favourite.

There are some people who regard this fondness for steam as a symptom of die-hard conservatism; but we are rather of the opinion that there is a great deal more in it. The outstanding and still-growing enthusiasm for miniature steam locomotives, and the real flutter of excitement that followed our announcement of having some traction engines running under steam at the "M.E." Exhibition this year, shows plainly that the steam-driven model has something which the others have not got. This idea is brought home even more potently when we realise that this preference for steam as a motive power is shown by so many of the rising generation of model engineers.

It may be due to some kind of subconscious idea that, in steam, we have an easily-generated, simply-controlled source of ample power for performing prodigies of haulage, which fascinates the young technically-minded enthusiast, and urges him to take practical steps towards investigating the subject. The element of risk involved in the construction and operation of steam generators has its attractions for the adventurous, and we know of many a boy who can obtain the greatest satisfaction from steaming a simple "pot" boiler and using the steam to drive, for hours, an "engine" which consists merely of a piece of bent stout wire, with a flywheel at one end and a crank at the other, mounted on some sort of bearing and rotated by means of a crude oscillating cylinder.

Nearly always, is this, or something very like it, the beginning of an interest in model engineering; later, there comes the inevitable visit to the "M.E." Exhibition, where the broadening of our young hero's ideas is taken firmly, but unobtrusively in hand.

Thus are model engineers made; but we would, of course, be among the first to agree that the "broadening" process does not take the same form in each case. We believe, however, that it is seldom a young enthusiast, after his first visit to the show, fails to take up some form of model making, sooner or later. The desire to make miniature reproductions of all kinds of familiar objects has been a human trait from the beginning of civilisation, and it will probably continue till the end of time. We are all born craftsmen; but the craftsmanship wants encouraging, guiding and developing, and this is but one other sphere in which the "M.E." Exhibition has a part to play. The fascination of steam may well lead to some far-reaching development, later on.

### Ship Modelling

● THE MODEL ships section of the "M.E." Exhibition is the strongest, this year, there being upwards of 120 exhibits in that section alone. This is by no means the first occasion on which the same thing has occurred, and it gives us an opportunity to discuss a question which is often put to us by certain well-meaning critics; it is: Why are ship models admitted to the "M.E." Exhibition, since their construction does not involve *engineering*?

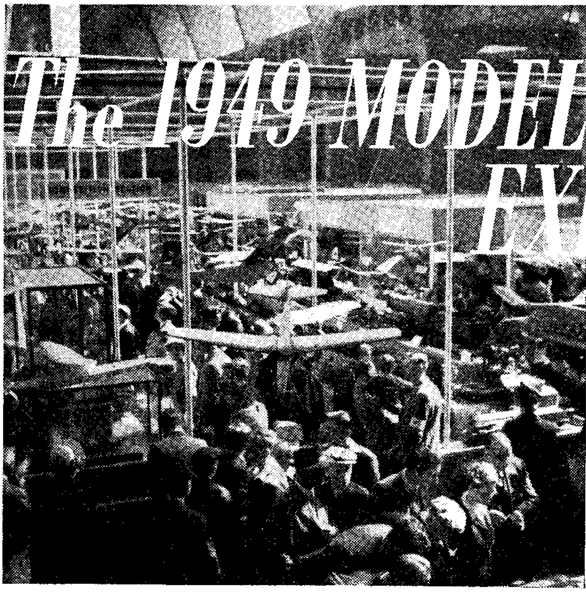
This is an old question which has been discussed in these pages more than once; but it still comes along and, therefore, justifies a reply. There are many aspects of our hobby which may not be "engineering" in the strictest sense of the word; most architectural subjects come within this category, and the list could be easily extended.

But the construction of miniatures of every kind requires the application of practical craftsmanship which may not necessarily involve a knowledge of any engineering process whatever; and there is the possibility that a few of the world's finest ship models have been constructed in a manner that did not include the use of any mechanical or electrical knowledge or device, and so cannot be regarded as "engineering" in any sense. No-one, however, could deny that such work demanded a very high degree of craftsmanship in its execution. The model engineering hobby, as practised today, everywhere covers many different aspects of pure craftsmanship as well as the more mechanical, electrical and physical operations that are implied under the title of "engineering." The scope and policy of THE MODEL ENGINEER have always been deliberately planned on these lines, and we believe that a great majority of model engineers would agree that to exclude pure craftsmanship would narrow the field too much.

It is not always easy to decide just where pure craftsmanship ends and engineering begins; we have only to recall that shipbuilding is today one of the world's greatest engineering industries, as it was in the days when Newcomen was building his engines mostly of timber.

We feel that the Ship Models section of the "M.E." Exhibition is more than justified since the quality of craftsmanship it displays is no less than that of any other section.

# The 1949 MODEL ENGINEER EXHIBITION

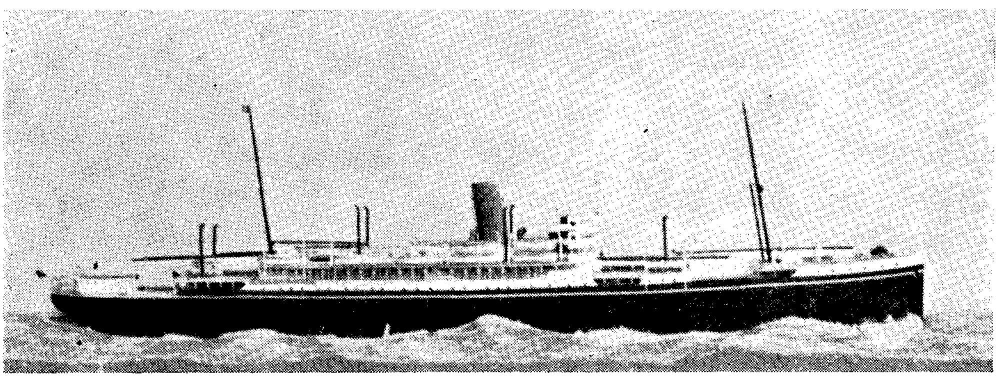


## *Further Notes and Pictures of some of the Entries*

FOLLOWING upon last week's issue, in which we gave our readers an idea of some of the good things to be seen at this year's show, we are presenting a further selection of pictures, together with information gleaned from various entry forms.

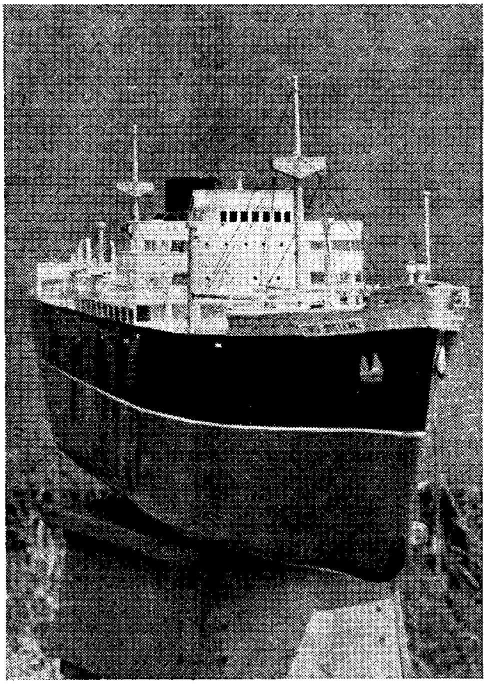
On the cover of this issue is a cab view of Mr. E. Rix's 4-6-2 locomotive *Liberty*, while freely interspersed among the following notes and fully displayed in the centre art pages, will be found plenty of illustrations which indicate clearly that the show, as usual, includes something to interest all visitors. The poet Cowper wrote: "Variety is the very spice of life." One could almost think that he had seen a MODEL ENGINEER Exhibition!

To continue our description of the ship models which are on view at our Exhibition and taking them more or less in chronological order, we should mention a model which we omitted when describing the period models in last week's issue. This is a model of the 50-gun ship of 1736 by Mr. Collins, of Gt. Bookham, Surrey, and is a copy of H.M.S. *Gloucester* in the Science Museum. From what we know of Mr. Collins' work it should be worthy of very careful study. Another model of this ship, this time by Mr. Moulton, of Putney, has also been entered. This is to the scale of 20 ft. to 1 in. We look forward to seeing a waterline model of an East Indiaman of 1815 which has been built by Mr. Morley, of Hawkhurst, Kent. The scale is 12 ft. to 1 in. and the details of the actual ship have been carefully studied by the builder. Mr. H. V. Evans, the secretary of the Thames Ship Model Society, which holds its meeting in the *Discovery*, has sent a picture-model of a Revenue Cutter *c.* 1805, built sailor fashion with the sails carved out of wood. The model is mounted on a panel and framed as a picture. Ship models of this type were very much in vogue during the Victorian era. Mr. R. Sandison, who lives in



*Mr. Kilner Berry's model of S.S. "Jervis Bay." This model was described in the builder's series of articles in "Model Ships and Power Boats"*

Aberdeenshire, sends a model of the American brig *Pilgrim*. Is this the greatest distance from which any of the ship models have been sent? Another brig model is that of the *Marie Sophie*, built in Denmark in 1789 and subsequently owned in Falmouth. This is to the scale of $\frac{1}{16}$ in. to 1 ft. and was sent in by Mr. F. R. H. Swann, O.B.E., of S.W.7. Mr. Swann has also entered a 1/32 in. to 1 ft. scale model of the French sailing ship *Charlemagne* built at Nantes in 1901. The prototype was a fine example of the famous—or notorious—subsidised ships against which the British sailing ships, having no subsidy, found it so difficult to compete. There are four *Cutty Sarks*, one a miniature by Donald McNarry, as



*A steam-driven model by Mr. S. V. Hill, of Redditch, made from the "Penang" articles in* THE MODEL ENGINEER

mentioned last week, one by Mr. B. A. Mason, of Chigwell, Essex, one by a lady ship modeller, Miss Patricia M. Crosby, of Grays, Essex, and one by Mr. J. S. Brown, of Walmer, Kent. We have seen a photograph of the last model which is a waterline model in full sail set in a lively sea. This appears to be a fine action model. Incidentally, a photograph of a scenic model can be a very severe test of its quality. A model which, if it is up to the builder's usual standard, will be well worth studying is that of the barquentine *Waterwitch* by Mr. F. W. Shipsides of Portishead, Somerset. The *Waterwitch* was well known as the last British ship to carry square sails. She is still afloat so far as we know, having been sold to Estonian owners in 1939. The scale of the model is $\frac{1}{8}$ in. to 1 ft. Mr. Shipsides' work is notable for accurate detail and for the realistic and artistic qualities of his seas. Another interesting model, this time by Mrs. Val Montagu, a lady ship modeller who secured an award in our 1947 Exhibition, is of the 50 ft. twin screw 50/50 motor yacht *Alcyon*. Mrs. Montagu owned and sailed this yacht some years ago, and thus her model is an embodiment of her intimate knowledge of the craft. The scale is $\frac{1}{8}$ in. to 1 ft. A small model of the Duke of Edinburgh's yacht *Bluebottle* is certain to attract a good deal of attention. This is entered by Mr. A. Keevil of Denmark Hill, S.E.5. Mr. M. Maltby of the Sheffield Ship Model Society, whose Whitby fishing coble was greatly admired last year, sends a scenic model of the ketch *Martinet* built to the drawings and details by Edgar J. March which appeared in THE MODEL ENGINEER in 1941. The scale is 1 in. to 20 ft. and the length of the actual model is $5\frac{1}{2}$ in. We are looking forward to seeing the model Chinese fishing vessel entered by Mr. J. A. Borrowman of the South London Ship Model Society. Mr. Borrowman knows his subject and his model should be full of interest. Other "foreigners" are the model of the Burmese paddy boat by Mr. J. R. Brookes of Sheffield, and the Indian canoe by Mr. B. Armstrong of Ingatestone, Essex. The last named model is made of copper and is built on ribs as in the full-sized canoe.

## Bottled Models

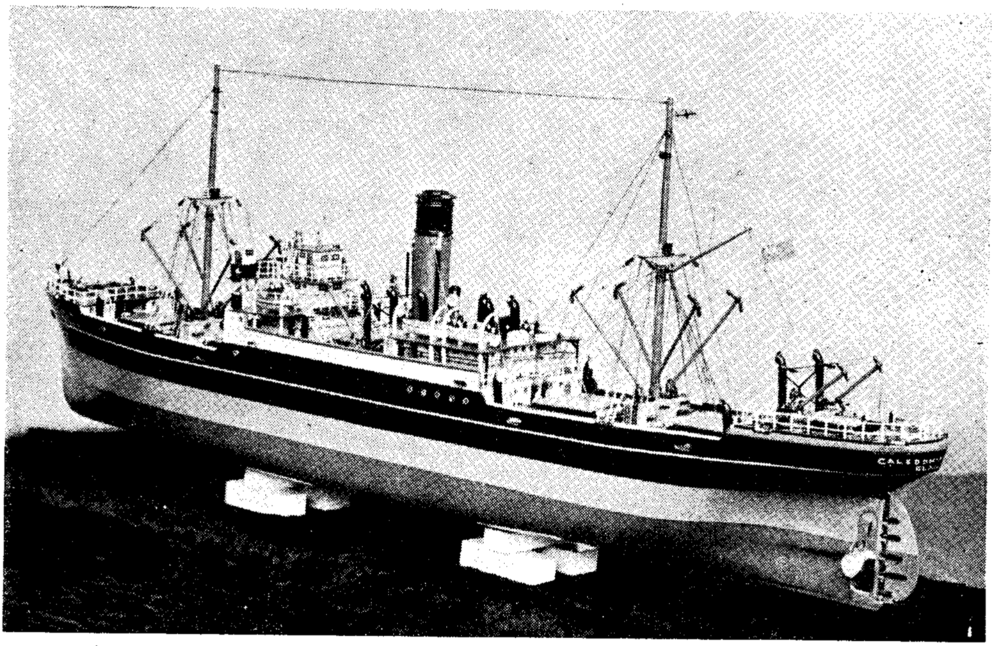
There are a number of models in bottles and this time there is a definite breakaway from the familiar types. The old-fashioned dimpled whisky bottle is giving way to the electric light bulb. Whether this is due to the difficulty of obtaining the bottles or to the excessive cost of whisky we wouldn't know, but more likely it is just an indication of the changing times. Two notable entries are in electric light bulbs and in each case they are mounted on a central pillar with the bulb in a vertical position. One is by Mr. Cliff Money of the Sheffield Ship Model Society and represents a Medieval carrack of 1402. Mr. Money declares that this type of model is easier than the usual one in a bottle, but he has a way of making difficult things seem easy. The other entry is by Mr. W. H. Honey of the South London Ship Model Society. Mr. Honey won the Sailing Ship Championship Cup in last year's Exhibition so we are expecting great things of his latest effort.

In THE MODEL ENGINEER for July 14th we pictured Mr. R. Butler's model yacht as being the smallest in the Exhibition. It is $\frac{7}{16}$ in. long overall and can be covered by a silver threepenny piece. A slightly larger model but one which contains much finer detail work is that of a full-rigged ship in a phial, entered by Mr. R. H. Biggs, of Dartford, Kent. This model measures $\frac{1}{2}$ in. from the tip of the jibboom to the end of the spanker boom. It has 15 square sails and the usual outfit of fore and aft sails. The difficulty in this model was not to get it into the phial, but to make and assemble the incredibly fine details of which the model is made. The phial was merely cut in half and the model inserted whole. Mr. Biggs has also entered four other models all of about the same size. He is an officer on the Prince Line of steamers trading out

east and, in collaboration with a friend, has made a book on the subject of ships in bottles which we are publishing shortly.

**The Miniatures**

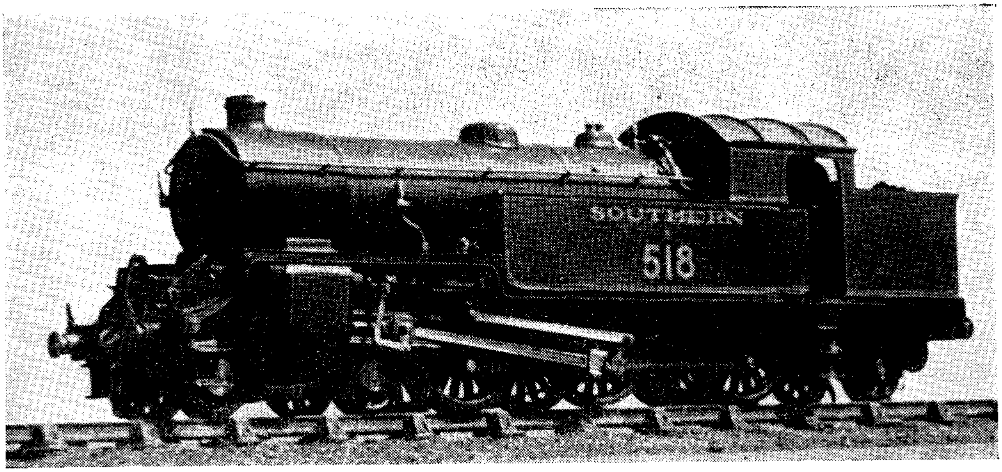
Among the miniatures is an interesting set of twelve Western Ocean liners of the past 100 years from *Britannia* of 1840 to the *Queen Elizabeth*. These are all to the scale of 1 in. to 100 ft. and afford an interesting comparison of the development of the ships on the American run. We have seen these models and the detail work is very fine. They are entered by Mr. Leslie Wilson of Dyserth, Flint. Mr. Kilner Berry of Worthing sends his model of S.S. *Jervis Bay*. This was described in his recent series of articles in *Model Ships and Power Boats*, and readers who are basing their modelling on these articles will be interested to see this model. Among the three entries by Mr. R. Dobree-Carey of N.W.11, a student of 18 years of age, are two miniatures, one of R.M.S. *Caronia* to the scale of 1/32 in. to 1 ft. and one of the steam yacht *Rover* to the scale of 1/64 in. to 1 ft. The *Rover* is a private luxury yacht built in 1920. We have seen this model, which has a water line length of 5 in. and were greatly impressed with the nice detail work and with the proportions and general appearance of the model as a whole. The *Caronia* with its green colour scheme and generally smart appearance, should make an attractive model if built to the same standard as the *Rover*. Mr. W. R. Finch of the North London Ship Model Society, some of whose models may be seen in the United Services Museum at Whitehall, sends a waterline model of M.S. *Dubreka*. The model is based on the drawings and photograph published in *The Motor Ship*. The modern lines and appearance of the M.V. *St. Essylt* have caught the eye of Mr. J. T. King of the South London Ship Model Society who sends in his 1 in. to 150 ft. scale model. He has also entered a model of H.M.S. *Crossbow*, a British destroyer. Modellers in cardboard will be interested to see the 15 in. long model of R.M.S. *Mauretania*—the new *Mauretania*, we presume. This is entered by Mr. Hugh O'Neill, of Ovington Square, S.W.3, and is constructed almost entirely of cardboard, to *Modelcraft* plans. Mr. R. Carpenter, D.S.C., of Brighton, sends two models, one of which represents to a scale of 1 in. to 50 ft. S.S. *Admiral Fraser*. She is shown at buoy loading crated cars and parts by a single derrick at No. 2 hatch and by "Burton" whip at No. 3 hatch. Action such as this adds greatly to the interest and realism of a model and we were interested to see how Mr. Carpenter has treated his subject. Mr. Keith P. Lewis, of Birkenhead, who is one of our most consistent—and successful—exhibitors, sends a model of the cross-channel steamer *Falaise*. The scale is 1 in. to 75 ft. and from the photo we have received the model seems to be up to Mr. Lewis's high standard and to represent faithfully this handsome ship.



*A fine model of S.S. "Caledonian Monarch" by Mr. D. W. Gale, of Lincoln, from articles in "Ships and Ship Models"*

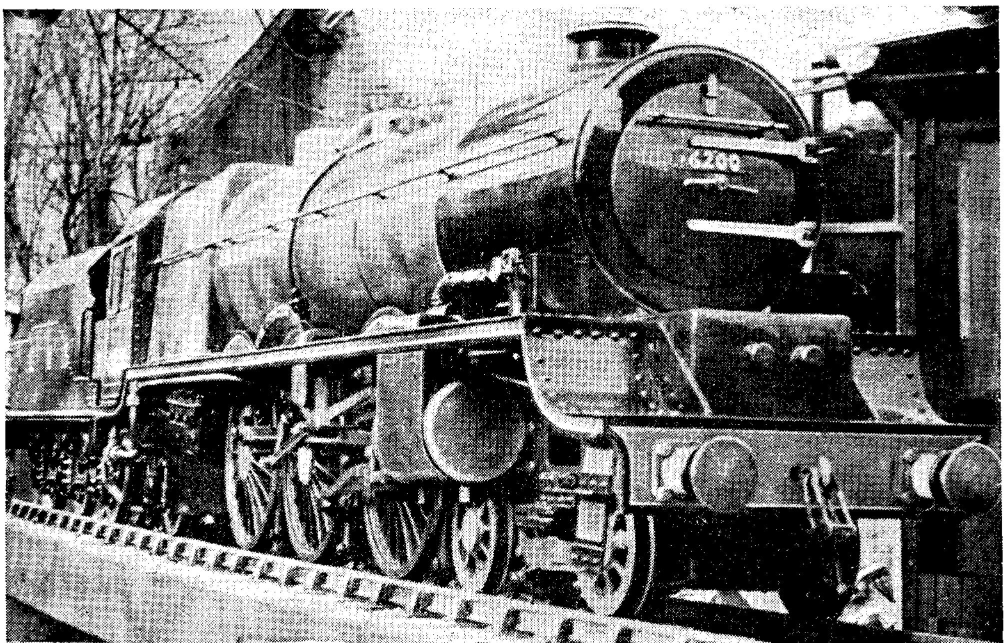
**Non-working Models**

Among the non-working models of steam and motor ships we have two very fine waterline models by Mr. A. C. Yeates, of Nottingham. One is of the L.M.S. steamer *Hibernia* built by Dennys, in 1921. Although old-fashioned by modern standards, she was a handsome ship



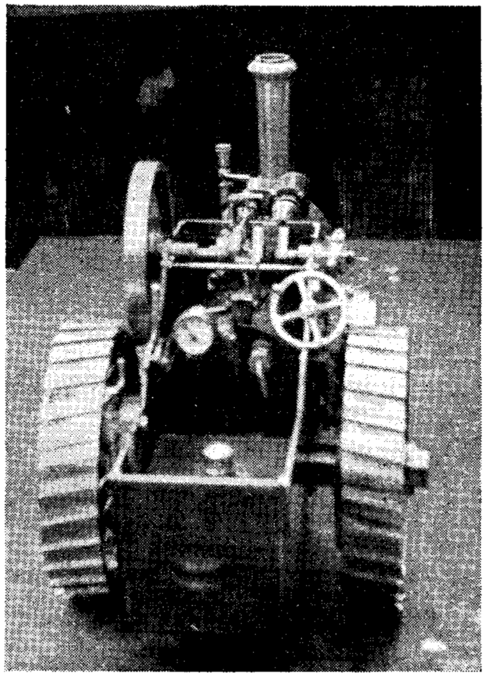

*A 7-mm. scale, electrically-driven model of one of the S.R. Urie "H-16" class 4-6-2 passenger tank engines, made by Mr. F. G. Arnold, of Petersham*

and the model reflects very effectively the beauty of the original. The other model is of the motor tanker *Scottish Borderer* built in 1923, also by Denny Brothers. This model is illustrated in the current issue of *Model Ships and Power Boats* and embodies some very neat detail work. The motor tanker *San Demetrio* which made history in the recent war is represented by a waterline model by Mr. E. N. Taylor, of Gosport. Mr. Taylor usually wins a high award in our Exhibition and we are looking forward to seeing his effort for this year. He also sends a model of the Ellerman liner T.S.S. *City of London* which will be worthy of notice. Mr. Anthes, of Sheffield, who is one of our most regular exhibitors sends a waterline model of the tanker S.S. *Beaconstreet* on which he served as an officer during the war. She is shown as she appeared when leaving Halifax, N.S., in 1944, and has none of the polish of the passenger liner. We saw this model at the Sheffield Exhibition at Easter and were struck with the multiplicity of fine detail it embodied.

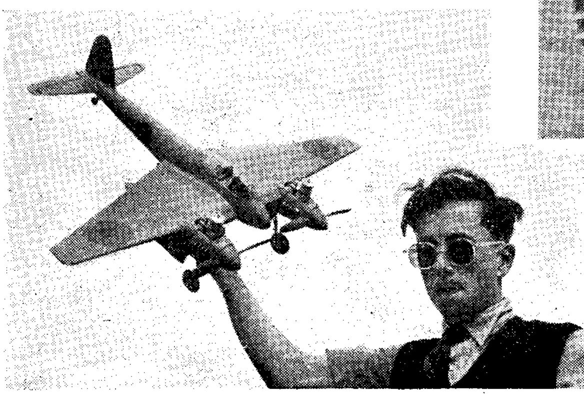



*An impressive view of the ¾-in. scale L.M.S. "Princess Royal" built by Mr. Blyth, of Ilford*

Even the anchor cable is studded. The boats and ventilators were made by depositing copper on a lead former. An idea of the quality and the nice proportions of the model of the cargo steamer *Caledonian Monarch* may be gained from the two photographs in this issue. This was built by Mr. D. W. Gale, of Lincoln, to the series of articles which appeared in *Ships and Ship Models* before the war. An interesting model is that of the new lifeboat which replaces the one which was lost in the attempt to rescue the crew of S.S. *Samtampa* when she went ashore near the Mumbles a year or more ago. This is to the scale of $\frac{1}{2}$ in. to 1 ft. and as the maker, Mr. H. G. Swarts, is the coxswain of the Barry lifeboat, the model should be well worthy of careful attention. The Dutch motor yacht, *Lingestroom* modelled in cardboard by Mr. R. V. Shelton, of Dunstable, should be worthy of notice. Considering the curves usually found in Dutch hulls it will be interesting to see how Mr. Shelton has solved the problem of representing these in a material such as cardboard.

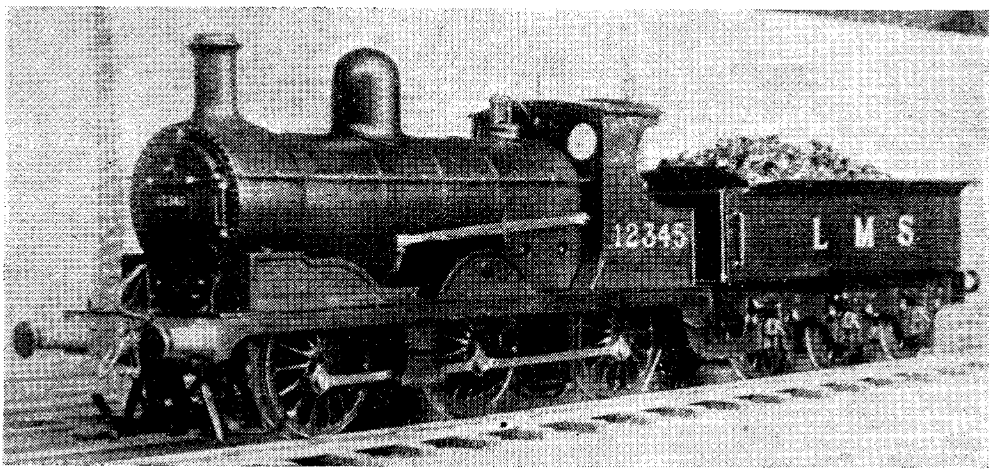


*What the driver sees! Rear-end view of Mr. T. Lloyd's $\frac{3}{4}$-in. scale Burrell traction engine*



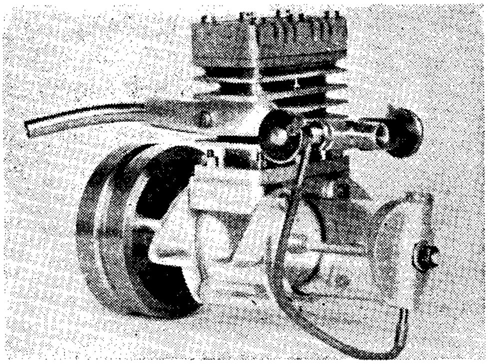
*This photograph shows the realistic lines of P. Donavour-Hickie's splendid de Havilland Hornet scale model*

Somewhat unusual models are the motor canal barge and the motorised Thames sailing barge sent in by Mr. W. Nutt, Jnr., of Laindon, Essex. These are to the scale of 4 mm. to 1 ft. so they will probably be incorporated later in a railway layout. Those who received their training on her during the




*A 4-mm. scale, 16.5-mm. gauge L.M.S. Aspinall 0-6-0 goods locomotive by Mr. E. H. Whittaker, of Timperley*

war will be interested to see the model of the Asdic training ship H.M.S. *Valena*, which was originally a steam yacht. The model, which was made by Mr. A. H. Hardy, of Birmingham, shows the ship in her wartime condition. The model of L.C.I. (s) 518 (Landing Craft Infantry, Small), by Mr. J. N. Hampton, of the Surbiton Ship Model Society, is an exquisite example of shipmodelling applied to a somewhat unusual



*A "split-single" compression-ignition engine by Mr. E. J. Newton*

craft. The model of M.V. *Port Pirie* sent in by Mr. W. C. Beaman, of Tooting, promises to be an interesting example of ship modelling. The builder went to great trouble to get his facts correct and has been making models from his schooldays. Fishing boats are represented by a model of the steam trawler *Mary White* built in Aberdeen, in 1935, sent in by Mr. K. Ward-Miller, of Surbiton, and a model of a typical North Sea drifter by Mr. F. Coates, of Leeds.

### Internal Combustion Engines

The number of models in this class is again comparatively low, but some rather interesting examples of engines have been entered. Among those made from MODEL ENGINEER designs may be mentioned a 15 c.c. o.h.v. "Kittiwake" engine by Mr. C. Hinchliffe of Rochdale. This is fitted with an "Atom" R type carburettor and magneto ignition.

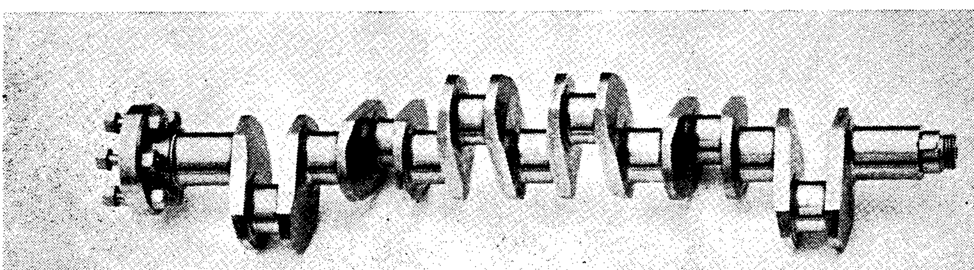
Mr. C. J. Potton, of Whitton, exhibits a "Ladybird" 2.5 c.c. engine to the design recently published in the MODEL ENGINEER, and Mr. H. Rae of Great Malvern has entered a 10 c.c. "Craftsman Twin," fitted with clutch and road wheels, for direct drive in a model racing car, together with a 10 c.c. racing car engine of 1 in. bore by ¾ in. stroke to his own design. This has been machined from solid stock material, and is of the gymmetrical-ported type, with domed piston, and the cylinder is Desaxe.

A 15 c.c. "Apex Minor" and carburettor are exhibited by Mr. T. Norris of London N.W.5, the design embodying minor modifications by the constructor.

The specification of the c.i. engine by Mr. E. J. Newton of Stockwell appears to be distinctly interesting. It is of the split-single 2-stroke type, having a bore of ½ in. and stroke of ¾ in., the total capacity being approximately 5 c.c. This has been machined from duralumin, the cylinders being without liners, and fitted with stainless-steel pistons. The carburettor is throttle-controlled, giving a speed range of 1,000 to 7,000 r.p.m. The two cylinders have separate connecting-rods, forked to operate on a single crankpin. Three transfer passages are formed in one cylinder, and two exhaust ports and one inlet port in the other. The design is based on that of certain types of continental motor-cycle engines.

The non-working models in this section include a ⅛ in. scale 6-throw diesel crankshaft by Mr. E. G. Rix, of Maidstone. This is turned from solid 3 per cent. nickel-steel, the design being copied from a full-sized crankshaft. It is 6¼ in. long and weighs 6½ ozs. P. O'Keefe of Charing exhibits a scale model of the Napier Sabre VII aircraft engine, fitted internally with an electric motor to provide rotation. The design has been obtained from photographs of the full-sized engine.

While not strictly in the i.c. engine section, an exhibit of interest in this respect is another example of the well-known MODEL ENGINEER Aveling "DX" type diesel road-roller, by Mr. G. H. Walter, of West Acton. This is constructed of castings obtained from Messrs. Bond's o' Euston Road, machined on a Myford M.L.4 3½-in. centre lathe fitted with home-made accessories.



*A scale model of a diesel lorry engine crankshaft, by Mr. E. G. Rix, of Maidstone*

### Tools and Workshop Appliances

Drilling machines are again well in evidence in this section, some being built to the well-

known MODEL ENGINEER design or based upon it, others of entirely free-lance design.

Mr. H. E. S. Chase of West Croydon exhibits the modified MODEL ENGINEER drilling machine which was illustrated and described in his article in the July 17th issue of the MODEL ENGINEER.

Another bench drilling machine of $\frac{1}{4}$ in. capacity is entered by Mr. S. W. Jones of Tamworth, and an experimental sensitive drilling machine with an original design of belt-tensioning device is entered by Mr. F. Lewis of Bromley.

Lathe attachments include a split nut and apron for internal lead screws by Mr. S. H. Abigail of Chiswick. This device incorporates some ingenious mechanical principles. The two half nuts, which have a vertical movement, are actuated by inclined slots cut in a separate plate which slides in a horizontal plane at the rear of the main frame. The operation is by means of an external lever, through the medium of a short Bowden cable.

Mr. H. A. R. Davies, of Croydon, exhibits a universal milling attachment made from castings from G. P. Potts of Denbigh, with a dividing head for lathe mandrel, and a number of cutters, taps and dies produced with the aid of the attachment.

A Potts universal milling spindle is entered by R. Goudie of Twickenham.

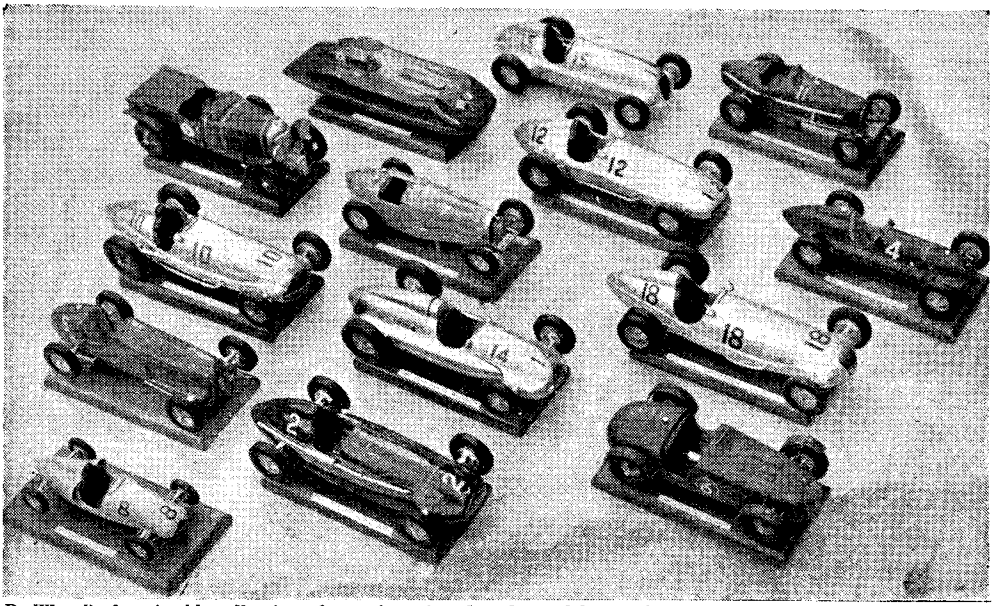
A dividing head for $3\frac{1}{2}$ in. lathes, based on the design by Ian Bradley, is exhibited by A. S. Hume of Stoke-on-Trent.

Mr. R. Thurley of Newbury has entered a rear tool post and fittings of the type described by "Duplex," with slight modifications to suit his own lathe. The castings were made from his own patterns.

A tailstock turret and holder built from scrap material is exhibited by W. Wright of Plumstead.

The general design of this is similar to commercial types, but specially adapted to suit the constructor's lathe.

Mr. A. E. Bowyer-Lowe, of Letchworth, exhibits a universal rotating and dividing table for use on the lathe and milling machine. The edge of the table is graduated in degrees, with a vernier reading to 15 minutes, and the table rotates and tilts up to 90 deg. The construction, including the dividing, was done on a 5-in. lathe with the aid of a home-made dividing attachment.



*R. Ward's formidable collection of non-functional scale models, the first of which was started in February of this year! Mr. Ward is known for his excellent paintings of full-sized racing cars and locomotives*

A set of knurling tools for a $3\frac{1}{2}$-in. centre lathe, with adjustment up to $2\frac{1}{4}$ in. diameter, and designed to relieve the lathe of all side strain, is entered by W. H Rider, of Wembley.

A set of miniature machine tools, including a wood turning lathe weighing 1 oz., a bandsaw weighing 2 ozs., and a sanding machine weighing 1 oz., is entered by K. D. Brown, of Plumstead.

Mr. T. Spike, who has exhibited machine tool models in previous exhibitions, shows a model hacksaw machine which takes 6 in. blades and will cut metal up to $1\frac{1}{2}$ in. thick. It is equipped with an automatic stop, and running speed is 40 r.p.m.

A somewhat unusual exhibit in this section is the hand-press for piercing, punching and bending small sheet metal parts by E. A. Lee, of Tottenham.

Mr. D. V. Halestrap, of Twickenham, has entered a machinist's hammer kit, comprising an all-steel hammer with hollow shaft containing centre punch, chisel and scriber.

A set of miscellaneous tools, including a machine vice, die-stocks and V-blocks to the constructor's own design is exhibited by Mr. J. Hodgson of London N.W.2.

(*To be continued*)

# The M.P.B.A. International Regatta

*Preparing the " B " class boats for the race ; Mr. Stalham's " Tha II " being closely examined by Messrs. Clarke and Williams*

THE Eighteenth International Regatta promoted by the Model Power Boat Association, was held at Victoria Park, London, on Sunday July 17th, and despite the absence of competitors from abroad and also the somewhat unsettled weather, proved to be the best speed event seen for some time.

There were thrills in plenty for the spectators, including some amazing aerobatics from Mr. B. Miles new 10 c.c. boat, which turned a complete back somersault at about 50 m.p.h. and continued running at full speed as if nothing had happened !

The first race, for Class " C " (Restricted) boats, over 500 yds. showed several examples of " McCoy " and " Dooling " engined craft, some of the fastest of these, however, had difficulty in staying the course.

Mr. G. Stone (Malden) had *Lady Babs II*, and a new boat *Rodney* running in this race, but was unfortunate in being unable to complete a run due either to capsizing or engine failure, on any of his attempts. Mr. Phillips (S. London) while stalling on his first run, made up for this on his second attempt, recording 39.2 m.p.h., the runner up being Mr. A. W. Stone (S. London).

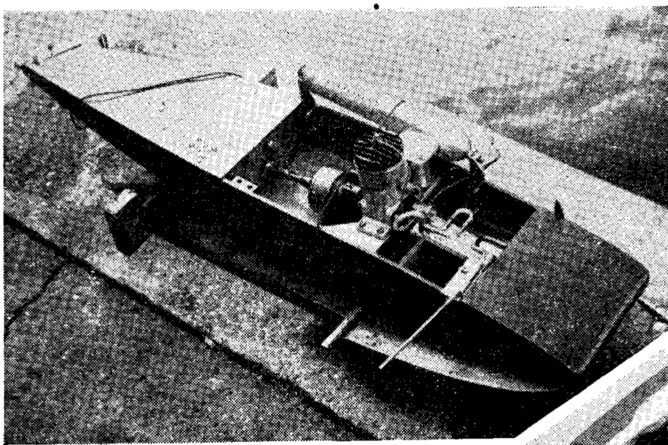
| **Result :—** | sec. | m.p.h. |
|---|---|---|
| 1st—Mr. Phillips (S. London) | 26.0 | 39.2 |
| 2nd—Mr. A. W. Stone (S. London) .. .. .. | 28.0 | 36.5 |
| 3rd—Mr. Stanworth (Bournville) .. .. .. | 33.2 | 30.8 |

The winner of this event holds a new trophy donated by the makers of E.D. engines—Messrs. Electronic Developments Ltd.

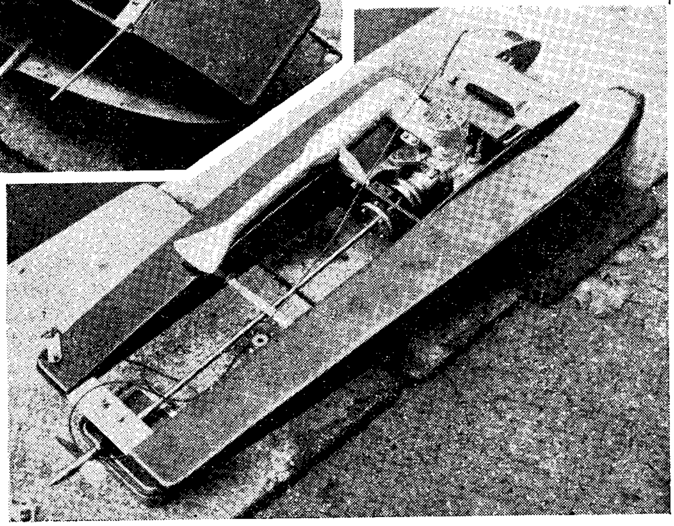
The second race on the programme was a " B " Class race, also over 500 yds. for the Miniature Speed Championship Trophy.

First competitor was Mr. G. Lines (Orpington) with *Sparky* and a good run was made at about 40 m.p.h. Next came Mr. F. Jutton (Guildford) with his well-known flash steamer *Vesta II* (now happily repaired after a recent mishap) and an excellent run resulted in a speed of well over 40 m.p.h. This speed was beaten by Mr. B. Mitchell's *Beta* (Runcorn), 22.77 sec. (45 m.p.h.). The running of these three craft was exemplary and made a grand start for this race. Mr. Martin (Southampton) with *Tornado III* was unlucky when his boat failed to take up the line and collided with the tripod, breaking the propeller off at the tailshaft. Another of the later competitors, Mr. Stalham (King's Lynn) made a good run at about 35 m.p.h. with *Tha*, although not running as cleanly as usual.

On the second " round," Mr. Jutton's



*Bird's-eye views of Mr. Miles' "aerobatic" 10-c.c. boat (left) and Mr. G. Stone's "Lady Babs II" (below)*



*Vesta II* made a fine effort, just failing to beat *Beta* by .03 sec.; this caused great excitement as after a slow first lap *Vesta II* speeded up to over 50 m.p.h.

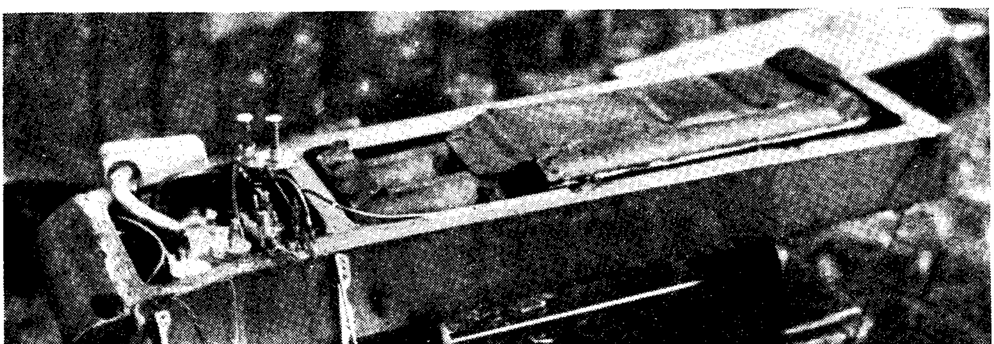
Mr. Mitchell's second try was slightly slower, as also was Mr. Lines. Mr. Dalziel's *Naiad* (Bournville) was well off form on this occasion, though it managed to complete the course.

**Result** :—

| | sec. | m.p.h. |
|---|---|---|
| 1st—Mr. B. Mitchell (Runcorn), *Beta* .. .. .. | 22.77 | 45.0 |
| 2nd—Mr. F. Jutton (Guildford), *Vesta II* .. .. | 22.8 | 44.8 |
| 3rd—Mr. G. Lines (Orpington), *Sparky* .. .. .. | 25.55 | 40.0 |

A short lunch interval followed, and when this was duly over racing was resumed with a Class "C" race for the Wico-Pacy Cup, run over 500 yd.

(*Continued on page* 212)

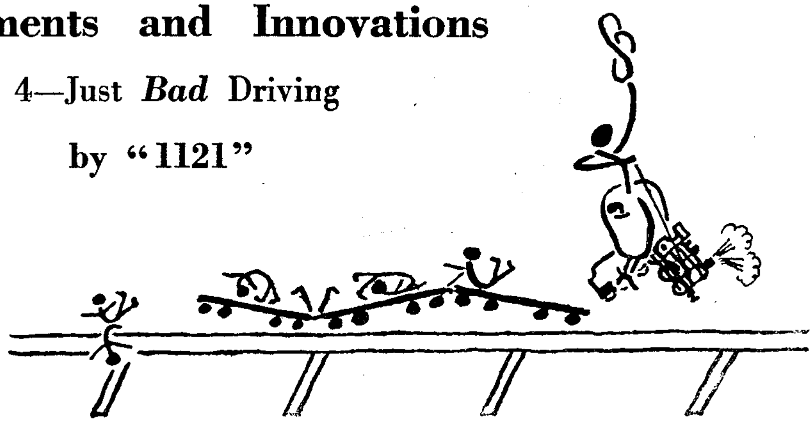


*Mr. F. Jutton's "Vesta II," repaired after its crash at Wimbledon Common, put up a good performance in the "B" class event*

# Improvements and Innovations

## No. 4—Just *Bad* Driving

### by "1121"



*" The Notcher-upper "*

WE have already, in " Dangerous Driving ! " listed certain types of drivers whom we view with disfavour for their undesirable carryings-on when working public traffic. These were the people who might be directly responsible for accidents, which *could* be serious and do perhaps irreparable harm to our cause. We have also given some preliminary details of the S.M.E.E. Affiliation's certificating scheme, which is intended to weed out those folk with objectionable habits from those who may be relied on not to let the side down, so that any track superintendent needing drivers may have some idea of the desirability of any stranger offering assistance. Now, should any applicant for a certificate fail to satisfy the examiners, or should he feel that his experience and proficiency are inadequate for it to be worth his while applying for a certificate, we would hate to see him slink, discouraged, back to oblivion ; we would far rather he came back again later for another try, having endeavoured to improve his driving in the interim.

**Recognise Yourself**

To assist such folk to recognise in themselves some of the worst faults which might lose them points in a test, we have prepared the following list of typical offenders, which any interested people may care to study, while digesting our previous notes on the scheme. This collection is intended as a kind of sequel to the " Dangerous Driving ! " list, and the faults here presented, though none of them may constitute in itself a direct serious danger, indicate that the driver lacks *perfect* control of his engine, and any wandering of attention from the business of hauling passengers to an imperfectly-understood engine, can represent an indirect undermining of safety.

We wish to make it clear that, unlike the examples shown in " Dangerous Driving ! " which were all of a thoughtless and selfish character, the faults we are dealing with here *can* be caused by *over diligence.* This may sound paradoxical, but we hope our meaning will become clearer on examination of the examples. Before we go on to consider these examples, however, we would like to draw attention to an unwritten law, which, in our opinion, gives the key to most, if not all of the faults here discussed. This law we will call " The Law of Contrasts." It would be silly to expect a man who earns his living riveting up ships' plates to be able to mend a wrist-watch merely because he is an engineer. In the same way, one would hardly blame a man accustomed to repairing car dynamos for feeling a bit lost if called upon to service a generator in Battersea Power Station. The degree of skill and extent of knowledge required might be no different in either case, but the size of work familiar to one man would appear fantastic to the other.

**Large and Small**

Now, this is the case with locos. If a man is used to driving locos in 2½-in. gauge, and is suddenly called upon to operate one in 15-in. gauge, he would have some difficulty in adapting his knowledge to the increased size. There is a time-lag between the operating of a handle in the cab and its effect on boiler-pressure, water-level, or whatever the case might be, and likewise between a change of conditions in the engine's internals and its becoming apparent on gauges, etc. The larger the scale of the model the longer is this time-lag, and the increase is nothing like proportional. What is more important at the moment, however, because it can be directly responsible for the faults we list here, is the fact that the reverse is just as true, and even more noticeable—the up-and-down antics of pressure and water in an engine of small scale are bewildering in the extreme to a man used to a larger engine, although they might appear slow, by comparison, to a man used to a smaller scale still. From this it will be appreciated that the man used to full-sized engines is at the worst disadvantage in this respect, which is unfortunate, because from his training and knowledge he should be the best fitted to take charge of our little boilers. We have several good friends who snatch odd hours, here and there, in between turns of " full-sized " duty, to help us out on the track at exhibitions ; and we would sometimes

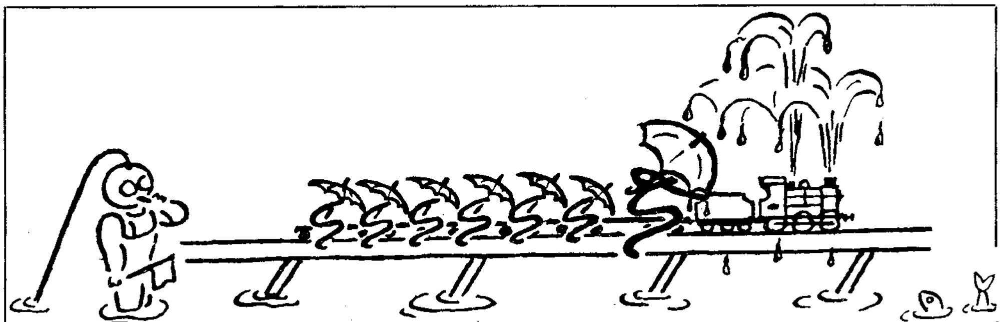
be hard put to it to manage without them, with perhaps two engines running, a third on the test stand, and others in the process of being got ready for service, or cleaned down afterwards. It is noticeable, however, that these good folk take a little time to get used to the double-quick-time fluctuations of our little engines, after they have been accustomed to their big ones, which, to those of us lucky enough to have had any experience in driving, seem slow, long-winded, cumbersome and even-tempered in the extreme. It is natural that at first these people should appear a bit heavy-handed, and be inclined to overdo such things as opening the regulator and adjusting the blower. After a few hours' driving on our track, however, they get used to the feel of things, and then, presumably, have to learn how to drive their own engines all over again when they go back to work!

There are some people, however, who cannot claim the "Law of Contrasts" as an excuse for being heavy-handed. They have never driven any engines other than small ones, yet they do not seem to develop any improvement in touch, however much practice they get. They are the people we have mainly in mind when we say that a little friendly criticism may help them to realise their faults, thus giving them a better chance of passing the Affiliation's tests should they desire to do so.

The first miscreant we will present is :—

**"The Notcher-upper"**

This gentleman must needs impress on the assembled company of ignorant amateurs that he *knows* about notching-up, whether conditions are suitable for its use or not. We have proved many times that notching-up on a good engine can make the difference between having to use the injector frequently because the axle-pump cannot cope with the demands being made on the boiler by the cylinders, and having to run part of the time with the by-pass open because it is supplying too much water. When an engine does not respond to notching-up, however, either because of bad design or workmanship, or through wear, the practice, like so many other things, must be indulged in with intelligent moderation, or the engine rebels by negotiating the track in a succession of jerks, which behaviour cannot be conducive either to efficiency or comfort.



*"The Water-squirter"*

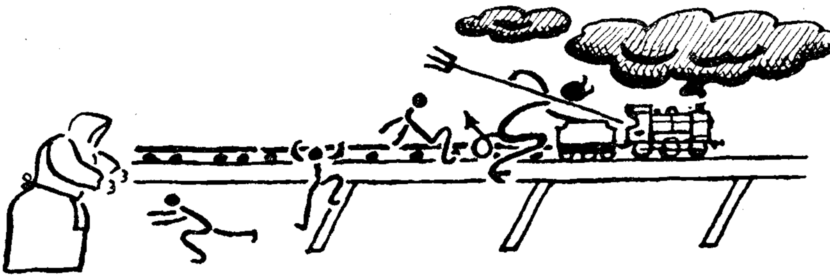
**"The Blower-offer"**

We believe that a boiler should be worked as far as possible at the point of maximum efficiency; that is to say, at the highest pressure which can be maintained without wasteful loss of steam from the safety-valves; or, to put it more simply still, just below blowing-off point. The steam locomotive may have to cope with conditions varying with a severity unknown in other spheres, and its boiler has been specially developed under the serious restrictions imposed by space limitations. It is absurd, therefore, to blow the results of all this development literally to the four winds by allowing precious steam to escape through the safety-valves, and probably taking with it a proportion of the store of water which has been accumulated in the boiler in the face of such severe competition, and may soon be needed desperately for the next spell of hard work. The type of driver to whom we refer considers a spectacular display of blowing-off, spark-shooting, whistle-blowing and general bedlam an essential necessity when driving a loco; but we have a far greater respect for the man who goes about the job quietly and efficiently, and has his pressure constantly at such a point that none of it is being wasted by violent blowing-off, but sufficiently close to the maximum for a touch of the blower to show itself immediately at the safety-valve should he wish it. Closely allied to this type of driver is the next:

**"The Blower-roarer"**

We have mentioned the fact that people who are used to driving engines of large scale are at first bewildered by the apparent trivialities which will affect the boiler-pressure and water-level of a small one; and until they get used to things, these folk adopt an understandable policy of "plenty of everything." They observe that when starting off down the track with a heavy train, a sudden drop in pressure occurs, and they hasten to repair this deficiency by the only rapid method available to them—that of turning on the blower. Although they know perfectly well that the harder the engine works the more its blast tends to intensify the fire, they don't realise that this automatic remedy takes place

with a rapidity comparable with the speed of the pressure-drop they are worried about, and it takes them a little time to gain sufficient confidence in this finnicky little box of tricks to trust it to look after itself. A pressure-drop of 25 per cent. in the boiler of a big engine might take some time to regain, and the natural reaction to seeing a pressure-gauge needle performing this nose-dive before their eyes is to open the blower. Their attention is then called to the business of stopping at the end of the track, reversing, and starting off back again, and after this has been successfully accomplished and they can attend again to the other half of their driver-fireman role (don't forget we ask them to do two jobs and they are only used to doing one !), they discover that the blower has suddenly grown in intensity to a deafening roar, and they are enveloped in a cloud of steam from the safety-valves.



*"The Stoker-upper"*

### "The Water-squirter"

In the same way the fluctuations of water-level in the boiler of a little engine can be alarming to a man used to a larger one. If the driver of a full-sized loco observes his water-level to be bobbing about somewhere just above the bottom nut, it is a serious business and must be remedied pronto. Furthermore, it may take him ten or fifteen minutes to restore the level to a safe working position and he can easily forget that this same feat on one of our little chaps can be accomplished in as many seconds. It is, therefore, perfectly understandable that, when he is asked to handle a thing which, by contrast, appears to have a hole in its boiler and drops its water out of sight every time he averts his eyes from the column, he plays safe and makes sure it is well topped up all the time. This is perfectly praiseworthy and is by far the lesser of the two evils ; but it results in an over-full boiler and excessive priming of the engine. If this type of driver is also a "Blower-roarer"—and the two faults usually go together, for reasons explained earlier—we have the state of affairs of a driver desperately endeavouring to keep his water at a level where he knows it won't play any tricks on him, and energetically blowing it all away via the safety-valves and exhaust, not to mention causing undue wear and tear and possible serious damage to the engine by all this water going through the cylinders.

### "The Stoker-upper"

By this we refer to the man who cannot leave his fire alone, particularly when raising steam. He spends 95 per cent. of the time with the firedoor wide open, minutely examining every piece of coal in the firebox, turning it over with the shovel and scrutinising the underneath of it, then turning it back again with the pricker to see if the top is still the same. Having completed this process over the whole grate area, he then swaps the lumps all round and and starts again. He would not dream of trying to raise steam with the smokebox door open, but causes practically the same conditions by leaving the fire-hole door open for long periods of time, and thinks nothing of it. Added to this cheerful forfeiting of draught, he is introducing cold air above the fire, which is the last thing it needs if it is to produce heat, and incidentally, sets up all sorts of damaging stresses in the firebox plates. When running, he travels the length of the track with pricker in hand, vigorously scrabbling at the unfortunate fire, opening up air-holes in its thickness, reducing the fire-bars to ruin, and incidentally severely limiting his concentration on the business of perambulating his passengers up and down the track. We appreciate that some kinds of coal are liable to cake in some kinds of engines, and need occasionally breaking up ; but there is moderation in all things, and there is a difference between separation and pulverisation.

### "The Wheel-spinner"

This individual does not appear to understand that the further he opens his regulator the higher the pressure of the steam working against the pistons. In cases of wet or greasy rails, this may represent a degree of power in excess of that which can be absorbed by the adhesive weight of the engine. Thus we have observed people of heavy-handed tendencies indulging in violent slipping when in charge of engines which we thought incapable of slipping, the resulting disaster to fire, steam-pressure, water-level, and wheels and motion of engine being nobody's business—except the driver's.

# A $\frac{5}{8}$ in. x $\frac{5}{8}$ in. D-A.S-V. Steam Engine

## by E. Feilden

THE following description, photo and drawings are of a $\frac{5}{8}$-in. × $\frac{5}{8}$-in. double-acting slide-valve steam engine.

The cylinder was built-up, the "port block" being silver-soldered to the cylinder barrel. After brazing, the bore was lapped to a fine finish.

The top cover was then made, and used as a jig for drilling the cylinder flange, which was tapped 8-B.A.

Gauge steel was used for the port face, and after the ports had been cut, screw holes were drilled and countersunk, and finished to size, as shown in the sketch. This was hardened and lapped.

### Piston

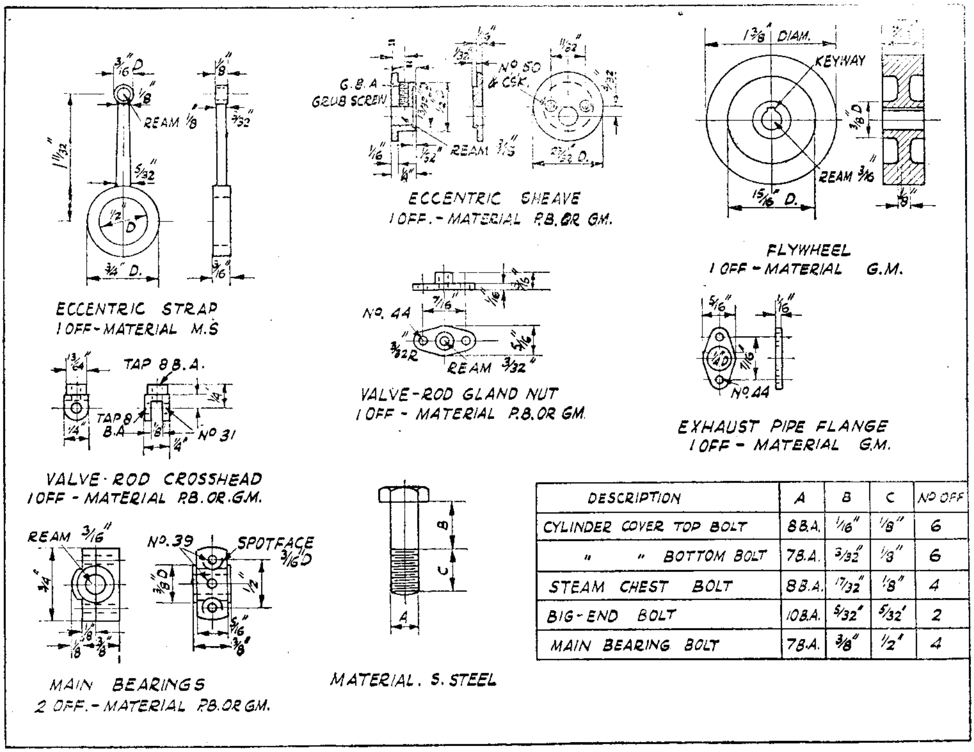
After being turned 0.020 in. oversize it was centred, drilled No. 44 and tapped 6-B.A. The piston-rod was shouldered and screwed 6-B.A., and the piston was then screwed firmly against the shoulder on the rod, which was put in a collet chuck and carefully turned to give 0.0005 in. clearance in the cylinder.

When machining the bottom cylinder cover, great care was taken to make the 5/32-in. piston-rod hole absolutely concentric with the turned spigot, which should be a push fit in the cylinder bore. The six bolt holes were then located and drilled No. 48.

A spigot mandrel was then made, when the gland boss could be turned and bored, care being taken to get this concentric with the centre hole. The cover was then put on the cylinder, the six holes in the flange were drilled No. 48 and tapped 7-B.A., the cylinder cover being used as a jig. The cover holes were then drilled No. 39, which will provide clearance for the 7-B.A. bolts. Four No. 38 holes for the standards were also drilled, as per sketch, but the gland studs were fitted after the gland-nut had been made. The outside was also profiled, according to sketch.

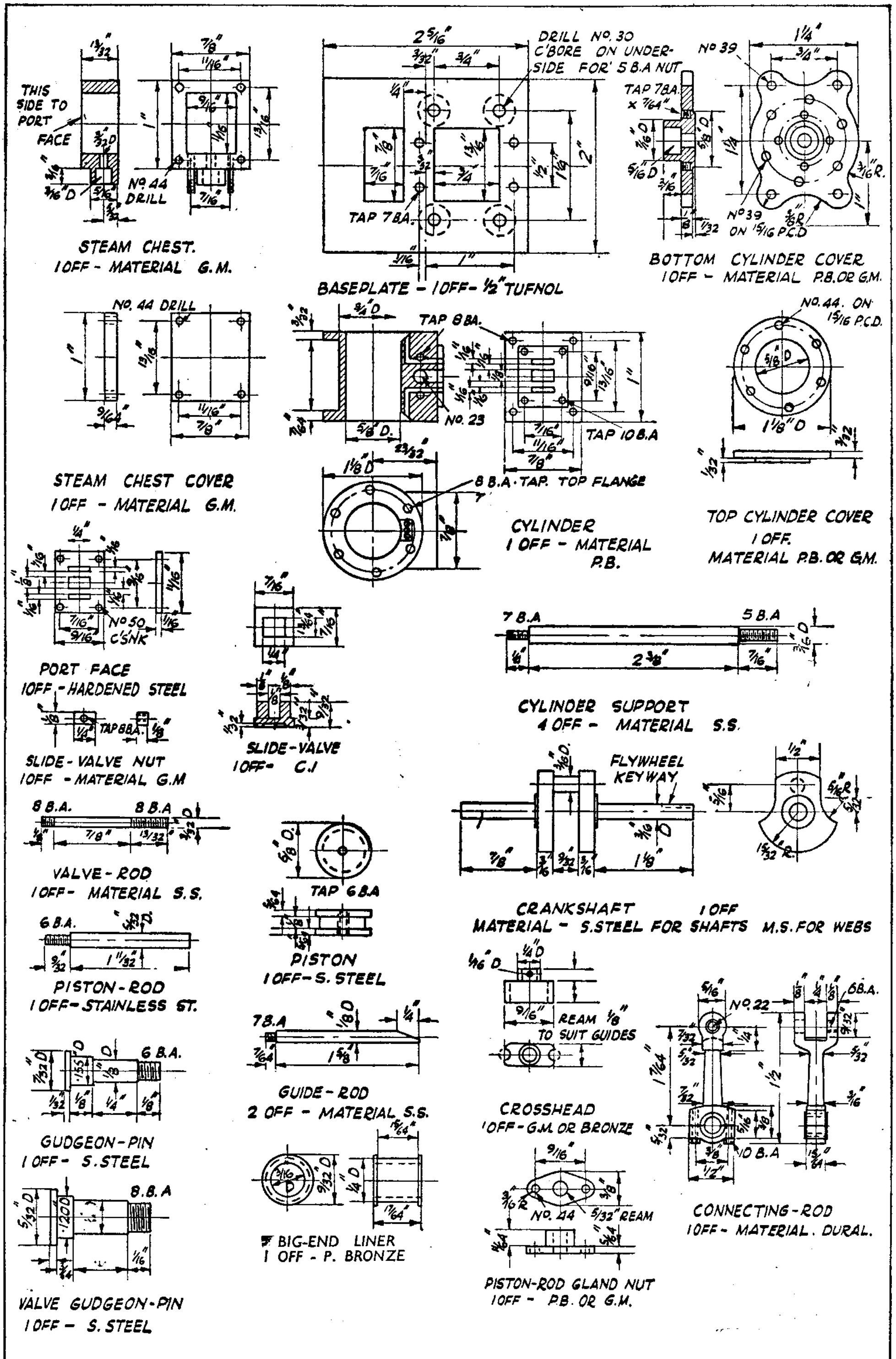
### Crosshead

Care was taken to see that the centre hole was a close fit on the piston-rod. The taper pin was fitted when the engine was assembled, and it could be seen that the piston had a balanced clearance at each end of the stroke. The unwanted half diameters of the guide-rod holes were filed away after the guide-rods had been located and fitted to the bottom cylinder cover.




| DESCRIPTION | A | B | C | NO OFF |
|---|---|---|---|---|
| CYLINDER COVER TOP BOLT | 8B.A. | 1/16" | 1/8" | 6 |
| " " BOTTOM BOLT | 7B.A. | 3/32" | 1/8" | 6 |
| STEAM CHEST BOLT | 8B.A. | 17/32" | 1/8" | 4 |
| BIG-END BOLT | 10B.A. | 5/32" | 5/32" | 2 |
| MAIN BEARING BOLT | 7B.A. | 3/8" | 1/2" | 4 |

*Details of the engine, and key to bolt dimensions*


THIS SIDE TO PORT FACE
NO. 44 DRILL
STEAM CHEST.
1 OFF - MATERIAL G.M.
DRILL NO. 30 C'BORE ON UNDER-SIDE FOR 5 B.A NUT
TAP 7 B.A.
BASEPLATE - 1 OFF - 1/2" TUFNOL
NO. 39
TAP 7 B.A. x 7/64"
NO. 39 ON 15/16 P.C.D.
BOTTOM CYLINDER COVER
1 OFF - MATERIAL P.B. OR G.M.
NO. 44 DRILL
STEAM CHEST COVER
1 OFF - MATERIAL G.M.
TAP 8 B.A.
NO. 23
TAP 10 B.A.
8 B.A. TAP. TOP FLANGE
CYLINDER
1 OFF - MATERIAL P.B.
NO. 44. ON 15/16 P.C.D.
TOP CYLINDER COVER
1 OFF.
MATERIAL P.B. OR G.M.
NO 50 C'SNK
PORT FACE
1 OFF - HARDENED STEEL
TAP 8 B.A.
SLIDE-VALVE NUT
1 OFF - MATERIAL G.M
SLIDE-VALVE
1 OFF - C.I
7 B.A
5 B.A
CYLINDER SUPPORT
4 OFF - MATERIAL S.S.
FLYWHEEL KEYWAY
CRANKSHAFT 1 OFF
MATERIAL - S.STEEL FOR SHAFTS M.S. FOR WEBS
8 B.A.
8 B.A
VALVE-ROD
1 OFF - MATERIAL S.S.
6 B.A.
PISTON-ROD
1 OFF - STAINLESS ST.
TAP 6 B.A
PISTON
1 OFF - S. STEEL
REAM 1/8" TO SUIT GUIDES
CROSSHEAD
1 OFF - G.M. OR BRONZE
6 B.A.
GUDGEON-PIN
1 OFF - S.STEEL
7 B.A
GUIDE-ROD
2 OFF - MATERIAL S.S.
NO. 22
6 B.A.
10 B.A
CONNECTING-ROD
1 OFF - MATERIAL. DURAL.
8 B.A
VALVE GUDGEON-PIN
1 OFF - S. STEEL
BIG-END LINER
1 OFF - P. BRONZE
NO. 44
5/32" REAM
PISTON-ROD GLAND NUT
1 OFF - P.B. OR G.M.

The gudgeon-pin hole is omitted on the drawing, this is in the centre and reamed ⅛ in.

### Crankshaft

This was brazed up, the crank webs being made from 1-in. stock. After fabrication, the balanced webs were shaped and the diameters turned to $\frac{15}{16}$ in. although a well-cut keyway will be perfectly correct for fitting flywheel. I fitted same very easily by filing a flat on crankshaft, width of key.

### Slide Valve

Sawn and filed to shape, the cavity was chipped and scraped to size, the slots in the back being made a sliding fit for the valve-nut. The face was then lapped flat.

### Connecting-rod

This was made of duralumin, with a split liner fitted in the big-end. The bottom half was pinned to prevent rotation in the rod.

### Eccentric Sheave

This was made spigoted, to enable the eccentric strap to be made solid. This gives a neat, strong job, and with the bearing surface shown, wear was found to be very small after considerable running.

Tufnol was used for the baseplate to achieve lightness with rigidity.

Other details are straightforward, and can be made without description fairly easily.

### Assembly

A turn of graphited yarn was put in the piston packing-groove, this was then eased into the cylinder.

A brown paper gasket was then made for the bottom cylinder flange, this was smeared with sealing compound and the bottom cover bolted up. The piston-rod stuffing box was then packed, and the gland-nut lock-nutted.

The crosshead was then placed on the piston-rod, and the guide-rods located and fitted to the bottom cylinder cover. It was then finished as shown in the sketch.

The crankshaft, with the two main bearings, was now bolted to the baseplate. When the con.-rod and the four standards had been assembled, a check was made to see that the piston had balanced clearances on both centres, and the taper pin was then fitted to the crosshead.

After screwing the valve crosshead securely on the valve spindle, this was placed in the stuffing box, which was then packed and the gland-nut lock-nutted.

The slide-valve nut was then screwed on, the slide-valve placed in position, and the steam chest bolted on the cylinder, without the cover.

The eccentric sheave and strap were then fitted, the sheave being set in the mid-travel position, with the crank at either end of the stroke. When, after adjusting the slide-valve and then sealing with steam chest and top cylinder cover, the model was ready for coupling to the steam supply and testing.

On the pressure of 100 lb. per sq. in. it reached a speed of 7,800 r.p.m.

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# The M.P.B.A. International Regatta

(*Continued from page* 205)

In this race only two competitors succeeded in staying the full distance, although some very promising boats were seen in action. Mr. B. Miles' new boat, after the performance mentioned at the beginning of this report, was very unlucky not to finish, but on the last lap again somersaulted and this time dived under. Two new boats in this class, by Messrs. Benson and Clarke respectively, failed to finish on either run, and Mr. Pinder (Malden) also had "stalling" trouble. It was left to Mr. Martin's small flash steamer *Zephyr* to make a good run at about 28 m.p.h., and Mr. Weaver's *Wizard of Oz* running up.

**Result :—**

| | sec. | m.p.h. |
|---|---|---|
| 1st—Mr. A. Martin (Southampton) .. .. .. .. | 36.7 | 27.9 |
| 2nd—Mr. A. Weaver (Victoria) | 40.6 | 25.5 |

The final event, the 500 yds. race for the International Trophy (Class "A"), was marred by heavy rain, and the racing had to be done in fits and starts. Some good performances were seen despite this handicap, in particular by the winner, Mr. B. Miles's supercharged twin four-stroke engined boat. This unusual craft won the event at the highest speed ever recorded in an International—over 50 m.p.h. The Class "A" record holder, Mr. Clifford's *Blue Streak* (55.6 m.p.h.) was off form, capsizing on both attempts, but very creditable runs were made by the place winners, Messrs. K. Williams and W. Meageen, both these competitors recorded speeds of over 40 m.p.h. Mr. Pains (S. London) with *Wasp*, although starting readily enough, had mysterious instability trouble, *Wasp* swinging about violently from side to side.

**Result :—**

| | sec. | m.p.h. |
|---|---|---|
| 1st—Mr. B. Miles (Malden) | 18.925 | 53.85 |
| 2nd—Mr. K. Williams (Bournville), *Faro* .. .. | 24.4 | 43.6 |
| 3rd—Mr. W. Meageen (Altrincham), *Samuel* .. .. | 24.32 | 42.3 |

The various trophies were presented by Mr. Noble, of Bristol, a well-known model power boat enthusiast right from the earliest days.

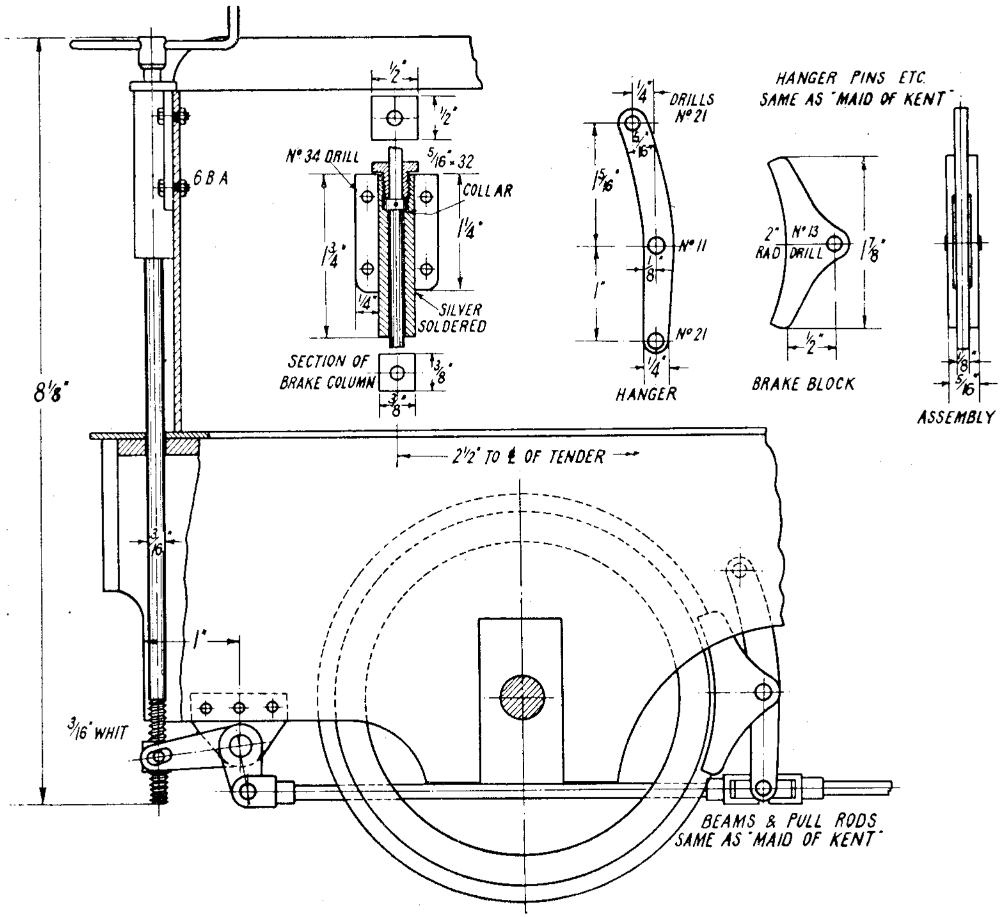
When presenting the International Trophy he commented that he had tried to win this trophy himself for many years, but the next best thing was to present it to the winner of this event, and congratulated all other competitors, too, on their performances.

# Tender Hand Brake for the "Minx"

## by "L.B.S.C."

THE actual construction of the parts, and the fitting of the tender hand brake for the "Minx," differs but little from the "Maid of Kent," so I only need draw attention to the variations. This will save time and space, and allow builders of the goods engines to carry on with the job without waiting. Fit the brake blocks and hangers first. As with the "Maid," castings should be used for the blocks if available; but if not, cut them from $\frac{5}{16}$-in. by $\frac{7}{8}$-in. steel bar, by same process as given for "Maid." Two or three correspondents have asked if there is any advantage in fitting blocks made from fibre, saying that it should not cause any wear on the wheel treads, whereas cast-iron would help to wear them. There is, of course, not the least objection to using fibre—you can paint it, and thus fool Inspector Meticulous—but, as I have already pointed out, the brakes should not be used for service stops, but only in emergency. Therefore, the question of excessive wear doesn't arise, in the ordinary course of events. Incidentally, fibre blocks are fine for brakes on passenger cars, as they grip better than iron. Two of my own cars have fibre brake blocks. I also used them on my first iron-wheeled passenger car about 28 years ago; not the very first, which I made up from a pair of disused roller-skates, with aluminium-alloy wheels.

The hangers on the "Minx" are curved, as shown, the offset being $\frac{1}{4}$ in. They can be made from $\frac{5}{16}$-in. by $\frac{1}{8}$-in. strip steel; you




*Tender hand brake for "Minx"*

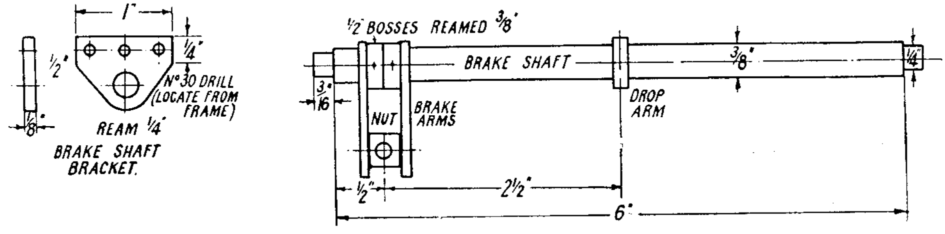
can curve it edgewise by catching it in the bench vice with enough projecting from the side of the jaws to allow bending leverage, or you can hold the end with a big pair of grips or a shifting spanner. Alternatively, the hangers can be sawn from any odd piece of frame steel, of suitable size, that may be left over fro.n frame operations; that cuts out (literally!) any need for bending. The assembly and erection are exactly the same as on the "Maid," using the same size hanger pins, in the holes already drilled in the frame. All three brake beams can be made and erected, using the dimensions and instructions given last week; ditto the second and third pull-rods.

## Brake Column and Spindle

The brake column on the old Brighton engines wasn't exactly a column at all (says Pat) but took the form of a square casting bolted to the front plate of the tender by two side flanges. The nut was inside, and two long flat rods connected the nut with the arm on the brake shaft below the footplate. The ends were slotted, so that the air-brake cylinder could operate the brake shaft irrespective of the position of the hand brake gear. We can simplify that a little, as we haven't any air brake, for a start, and also we want to use the same actuating gear as that on the "Maid," "for the sake of simplicity," as a famous catalogue puts it. At the same time, it can be made to look just like the doings on the big "Minxes"; and this is how, same as I did on "Grosvenor."

Saw off a bit of $\frac{3}{8}$-in. square brass rod, a little over $1\frac{3}{8}$ in. long, and chuck it truly in the four-jaw. Face the end, centre, and drill right through with $\frac{3}{16}$-in. clearing drill, No. 12. Open out to $\frac{3}{8}$ in. depth with 9/32-in. or letter "J" drill, and tap $\frac{5}{16}$ in. by 32. Reverse in chuck, and face off the other end. Chuck a bit of $\frac{1}{2}$-in. square rod in four-jaw, and set to run truly. Face, centre, and drill about $\frac{1}{2}$ in. depth with No. 12 drill. Turn down $\frac{1}{4}$ in. of the outside to $\frac{5}{16}$ in. diameter, and screw $\frac{5}{16}$ in. by 32; part off to leave a head 3/32 in. thick. Cut two strips of brass $1\frac{1}{4}$ in. long and $\frac{1}{4}$ in. wide, from 16-gauge metal, and silver-solder them at each side of the column, as shown in the illustration. This can be easily done by laying the three pieces in position on a flat piece of asbestos millboard, and getting busy with your blowlamp. Leave a slight fillet in the joint, and it will look like a casting. After cleaning up, drill four No. 34 holes in it, as shown, for the 6-B.A. bolts holding it to the front plate of the tender.

The brake spindle is a piece of $\frac{3}{16}$-in. round steel rod $8\frac{1}{2}$ in. long, with 1 in. of $\frac{3}{16}$-in. Whitworth thread on one end of it. The other end can be shouldered down to $\frac{1}{8}$ in. diameter, for a length of $\frac{5}{16}$ in. Make a little brass collar as described for the lower ends of the "Maid's" brake spindle, but only $\frac{1}{4}$ in. full diameter, and $\frac{1}{8}$ in. thick. Squeeze it on to the plain end of the spindle, until it is approximately $\frac{7}{8}$ in. from the end, and pin it. Now poke the screwed end of the spindle through the column, from the tapped end, until the collar enters the tapped part; then screw in the square-headed gland. When this is right home, the spindle should be quite free to turn, without any perceptible up-and-down movement. If it locks tight when the gland is home, take a shade off the gland. The fireman's handle and the boss at the top of the spindle, needs no detailing; make them same as the "Maid," except that the boss is shorter. Note that the square head of the gland must line up with the square column.




*Brake shaft and bracket*

To erect the assembly, drill a $\frac{3}{16}$-in. clearing hole, the centre of which is $\frac{3}{16}$ in. ahead of the front plate of the tender, and $2\frac{1}{2}$ in. to the left of the centre-line of tender, when you are looking at the front plate. This hole goes clean through both the soleplate and the top of the drag beam; use No. 11 drill, as the spindle should be perfectly free in it. Now put the screwed end of the brake spindle through it, and set the whole doings vertical; the square head of the gland nut should just rest on top of the tender front plate. Put a toolmakers' cramp over one of the side flanges and the tender front plate, then poke the No. 34 drill through the holes in the flanges, and drill through the plate. Remove any burrs, and attach the flanges to the plate by four 6-B.A. screws and nuts. I have shown hexagon heads, but round heads would do just as well.

## Brake-shaft and Erection

The brake-shaft is a $6\frac{3}{8}$-in. length of $\frac{3}{8}$-in. round mild-steel, shouldered down to $\frac{1}{4}$ in. diameter for $\frac{3}{16}$ in. length each end; a simple job needing no detailing. Beginners note, if your lathe hasn't a hollow mandrel, to allow for chucking in three-jaw, turn the brake-shaft between centres. The drop-arm is made and fixed in the centre, same as "Maid." The two brake arms are made in the same way also, as described for "Maid," but the bosses are $\frac{1}{2}$ in. diameter, and reamed $\frac{3}{8}$ in. Instead of being right at the end of the shaft, they are set with the centre of the brake-nut (made as described last week) $2\frac{1}{2}$ in. from centre of drop-arm; see illustration. Pin both bosses to the shaft, after adjusting arms to correct position.

The brackets are sawn and filed from $\frac{1}{8}$-in.

steel plate, another simple job. Drill and ream the holes for the brake-shaft bearings, but not the screwholes; these are located from the holes in frame. To set these out, mark off a point on the front end of each frame, 1 in. from the edge, and 1/8 in. from the bottom, centre-pop it, then make two more pops, level with the first, but 3/8 in. ahead and behind respectively. Drill all the holes No. 30, remove burrs, and put a bracket in place, holding with a cramp. The location of bracket is shown in the illustration. Drill through the bracket, using the frame holes as guide, and fix the bracket with 1/8-in. or 5-B.A. screws and nuts. Now put the brake-shaft in position, as described for the "Maid," letting the nut run up the spindle; put on the other bracket, holding temporarily with a cramp; set the shaft fair and level across the frames, then drill the other screwholes, and attach the bracket as above. The drop-arm is connected to the leading brake beam by a piece of 5/32-in. steel rod, with a fork at each end, exactly the same as the "Maid," except for length; this one should be approximately 5 1/4 in. between centres of pinholes. The other two are exactly the same as the "Maid's." Well, I think that is all I need say about the brakes; there is no need for repetition. All that now remains, to complete both engines, will be a few "trimmings."

**That Elusive Tyre Joint!**

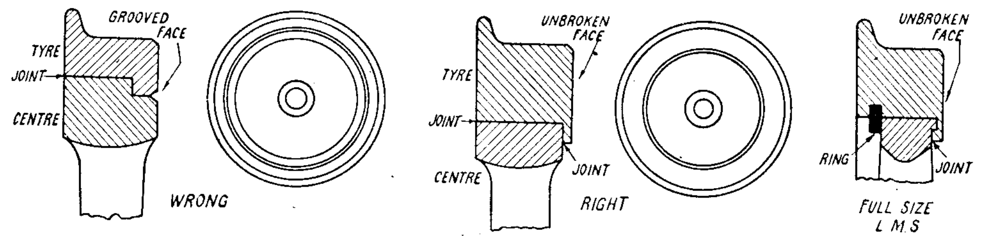
A letter received from a correspondent a few days ago, brings to a head a subject which has often made your humble servant chuckle, but so far I haven't said anything about it, believing in the old saying that "ignorance is bliss." However, my correspondent writes thus: "Being rather inclined to follow your old friend Inspector Meticulous in regard to details, and having read and heard a lot about the wheels of small locomotives not showing the joint between wheel and tyre, I thought I would show it on the wheels of my 'Doris,' so I went and had a look at some of her full-size relations. *To my great astonishment, I failed to find any signs of a joint*; the tyres seemed to be part and parcel of the wheels. This is something I fail to understand. In a commentary on the locomotives shown at one of the MODEL ENGINEER Exhibitions, the writer of the article bemoaned the fact that no joint was shown between wheel and tyre, on any of the locomotives that he examined. In a recent article in THE MODEL ENGINEER describing wheel construction, a deep groove is shown where wheel and tyre joins, in a two-piece wheel; and those who are using ordinary castings, are advised to turn a dummy groove in the face of the rim. Can you please say exactly where the joint should be, for I am completely bewildered."

Our friend is perfectly correct; *there is no visible joint shown in the rims of full-size locomotive wheels*, and those good but mistaken folk who turn grooves in the face of the rim, are completely in error. Regular followers of these notes may recall that in my instructions for wheel turning, I say that after facing off the outside of the wheel (that is, rim and boss) I put a parting tool crosswise in the rest, and turn a weeny rebate at the point where the spokes join the rim.

*That IS the joint between the wheel centre and the tyre!!*

Now, if you look at the reproduced illustrations, you will see how that comes about. The first one shows the "generally accepted" way, as recently advocated, but it is utterly and completely wrong, and I need not dilate on its shortcomings. No. 2 illustration shows how a correct two-piece wheel can be made for a little locomotive, by those who wish to take the trouble. The tyre is chucked in the three-jaw, back outwards, and bored out with a square-ended boring tool in the usual way, leaving a small lip around the front face. The wheel centre is then turned until it just won't enter; almost, but not quite, as the kiddies would say. If the tyre is placed on a piece of sheet iron, and the sheet iron put on the domestic gas-stove, it will be heated evenly, and will expand enough to allow the wheel centre to be pushed in fairly easily. When it cools off, the tyre will contract sufficiently to grip the centre firmly enough to dispense entirely with any further fixing. You can mount the whole lot in the way I describe for wheel turning, and turn the tyre as if it were part of the wheel centre. As mentioned above, in a one-piece casting, the rebate is formed with a parting-tool, and the result is a wheel of absolutely correct appearance, with an unbroken face to the rim.

Just as a matter of curiosity, and to reassure any "doubting Thomases," a section of the rim and tyre of a full-size L.M.S. wheel is appended. The tyre has an overhanging edge which fits a groove turned in the face of the wheel centre. In the back of the tyre, another groove is turned, and this contains a separate ring, which, combined with the lip at the front, prevents the tyre coming off in either direction, even if it cracked on the




*"Facts are chiels that winna ding, An' daurna be disputed."—Burns*

road. Cracked tyres are not entirely unknown, as any wheel-shop fitter or turner can readily confirm. I hope that little explanation will clear up my correspondent's dilemma, and also be the means of preventing good folk spoiling the appearance of the wheels of little locomotives, by turning grooves in them, which you don't see on any full-sized engine.

### A 5-in. Gauge "Doris"

Some time back, when discussing the pros and cons of building "Doris" in 5-in. gauge, I mentioned that several of this size actually were under construction; and since that time, news of several more has come to hand. Here is a picture of one, finished, all except final painting. She was built by Mr. Harold Thornber, a follower of these notes who hails from Burnley. Our friend says that up to the time he started on this engine, he had only built "OO"-gauge jobs; so the transition from what our trans-atlantic cousins call "flea-gauge" to 5-in. was quite a big jump! The locomotive thus is, in reality, a first attempt; and an exceedingly creditable one, at that.

Mr. Thornber says that as he couldn't get suitable wheel and cylinder castings from ordinary sources without waiting an unstated length of time, he made his own patterns and got castings made locally; the pattern-making was another first attempt, but the castings came out all right, the phosphor-bronze cylinders being cast solid. For drawings, our friend enlarged those I gave for the 3½-in. gauge engine, and borrowed some of the dimensions from "Maid" and "Minx," plus a few extra from the full-sized article. The boiler is a mixture of "Maid," "Minx," and "Swindon Kettle," enclosed in the "Doris" shell, and is a fine steamer. The whole bag of tricks comes well up to expectations. Mr. Thornber has only one flat car, but with 25 stone on it, the engine sails up a gradient of 1 in 30 as if it weren't there. The engine is now being painted in the British Railways style, black with the fancy lining.

I must not only congratulate our friend on his very good job, but also thank him for his kind appreciation of these notes, from which he says he learned all he knows about locomotive building. He never owned a lathe until the middle of 1946, when he acquired a second-hand Drummond; and the only practice-turning he had, was on the parts of a small petrol engine. When he made his decision to build a locomotive, he decided to go the whole hog and adopt 5-in. gauge. At that time, the description of "Maid" and "Minx" had just started; and he had obtained castings and material for "Maid of Kent," and just made a start, when the first instalment of the 3½-in. gauge L.M.S. class 5 appeared. That did it! This type of engine being his special favourite, he promptly dropped the lassie from Kent, and took up with the lassie from Lancashire, with the result that you see in the picture.

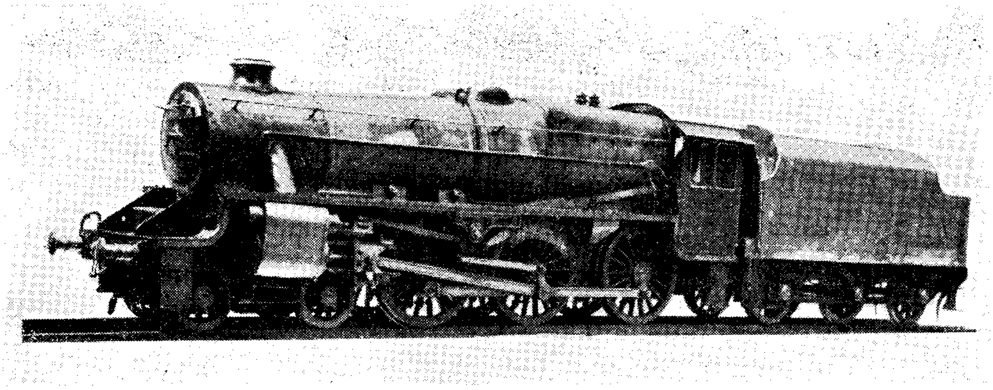
"Doris" is apparently a first priority with a good many other locomotive builders, too; for, judging by correspondence received, and the amount of castings, parts, and materials sold by our "approved" advertisers, the engines are springing into life all over the country. Incidentally, when illustrating Mr. L. V. Markwick's chassis, I forgot to mention that the castings for this were supplied by Kennion Bros., of Hertford, and I am glad to give credit where due.

### A Visit from "Susie M"

On July 9th last, I had the pleasure of seeing a little locomotive at work on my railway, of a type which hitherto had not made its appearance there. She was the narrow-gauge-type contractor's saddle-tank engine "Susie M," designed and built by Mr. M. E. Moon, the leader of the locomotive section of the North London S.M.E. of which your humble servant had the honour to be elected Patron. The occasion was the visit of her genial owner and builder, plus Mr. A. J. Bradley, who edits the club journal, and Mr. C. J. Drayson, who is another "Doris" fan, and brought his newly-made frames for inspection. Incidentally, they all arrived in an Austin 7 car, with "Susie" occupying most of the back seat. The advertisements say "you can depend on an Austin," otherwise "Susie" might have found herself in front, doing a spot of unorthodox "passenger-hauling"!

An improvement has recently been made to my little railway, in the shape of a 3 ft. tarmac path all around it, taking in the bottom of the fifty concrete posts, and extending 6 in. on the outside. One of the reasons for this, was to keep the grass and weeds away from the posts. It is a long job going all over the patch of grass enclosed by the railway, entailing over an hour's walk with the "Atco" mower; and the added labour of snipping all around the posts with hand shears, and doing under the line with the push mower (too low for the motor) became too much to tackle every two or three weeks, hence the improvement. Also, there is now no chance of the motor knocking off wing-nuts and other sundry excrescences against the posts, as there is no need to go close to them. Whilst the contractor's men were on the job, I got them to dig away the earth on the east side of the line, between the oval line and the high-level straight one, and bank it with a chalk-flint retaining wall. It now looks like Merstham cutting, and there is room enough for a car with footboards to go around. The few good folk who visit my road, are practically all used to riding astride, so they can now do so; and for that purpose, I rigged up a car on the Friday evening, for the express benefit of our North London friends. I found the piece of polished oak batten, that once carried the coat hooks in our air-raid shelter, fixed the two wood-block bogies off my old original test car on it, added one of the late Bro. Wholesale's footboard assemblies, rigged up a lap counter, and we were all set.

A couple of hours were spent inspecting the contents of my workshop, and the stud of locomotives, and after a cup of the enginemen's best friend, we went out to the railway. Whilst Mr. Moon got up steam, I did a bit of fettling up on the line, which was badly needed, owing to the effects of the hot weather, and not being able to attend to it whilst the path was being laid. On the first few laps there were three or four car derailments, but the bad places were noted,



*Mr. H. Thornber's 5-in. gauge "Doris"*

flattened out, and soon all was well. "Susie" trotted around in grand style, plenty of steam and water, and bags of power, hauling a constant load of three passengers, as the visitors all took a turn at driving. It was the first time the engine had been on a continuous run. A special car is needed to drive her, and for that reason I did not have a go, as Mr. Moon's car is arranged for an astride rider, and I cannot ride that way. However, it was a pleasant change for me to see somebody else doing the job!

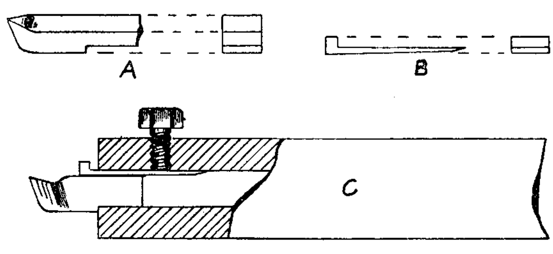
Mr. Moon has an ingenious steam-raising device. It consists of a horizontal fan in a case, like a hair-dryer, powered by a 6-volt motor, the suction pipe fitting in the engine's chimney; similar arrangements have been illustrated in these notes. The "juice" for operating the motor, is provided by a "government surplus" hand-driven generator, which is more convenient than using an accumulator, and doesn't need much physical exertion. It is just the ideal for use when taking the engine to a club track, or similar excursion, where there is no "resident" blower available.

After "Susie" had finished her running, the North London boys said they would like to see "Jeanie Deans" at work; so I got up steam, and "Jeanie" promptly proceeded to "astonish the natives" in her usual style, gliding off without a puff, tearing around at an equivalent of over 100 m.p.h. and blowing off every time the firehole door was shut, except when the injector was working at the same time. After she had run a mile or so, I asked them if they would like to drive her, but they wouldn't chance it, said she was a bit too wild; so I did another 20 laps without touching the fire (just under a mile) and then demonstrated how the injector would work at low pressure, starting it at less than 30 lb. and letting it feed until there wasn't enough steam to blow the whistle. Our good friends finally departed "as the shades of night were falling," saying that they had had a smashing time—yet they never smashed a blessed thing!

# Using Short Tools in Bar

MANY lathe tools are written off as useless because they have become too short to secure in the tool bar. These tools have been made short due to reforging many times, but still the cutting head could continue to be used, if the shank portion could be secured in the lathe tool bar. A very reliable method of overcoming this problem is as follows:—

First, grind the under end of the tool shank as indicated at "A," in the accompanying illustrations. Make sure the corner is nicely squared, and if the cutting head is already correctly tempered, take care to keep the shank cool during grinding. Now shape a wedge key, as indicated at "B," which may be made in mild-steel.

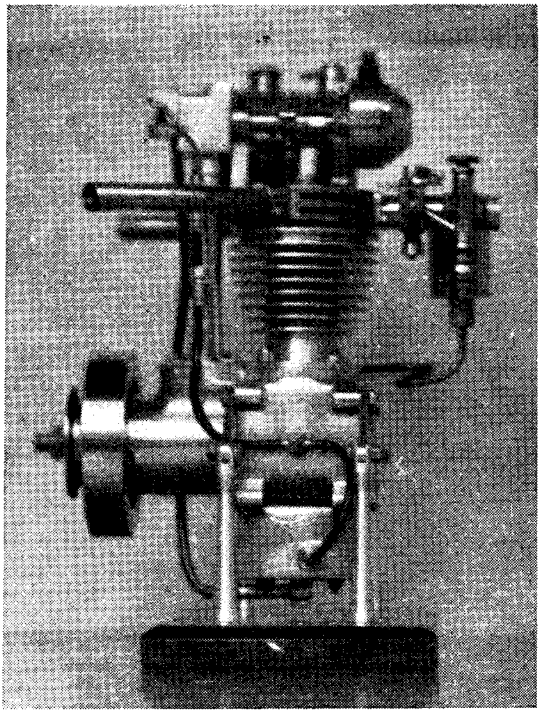



The size of the key will depend upon the size of tool shank and tool holder. Secure the treated short tool as indicated at "C," by placing ground portion of the shank up to the face of the bar, then slipping the wedge in position as shown and making fast by means of the tool bar screw in the usual way.—W. J. SAUNDERS.

# A 10 c.c. Overhead Camshaft Petrol Engine

## by G. D. Reynolds

*(Photographs by F. Ayres)*



IN the winter of 1948 I looked around for something to do in my workshop—the spare room. By chance, I met Mr. Dray, of Farnborough, and after having a very interesting evening at his workshop, I decided to build a 10 c.c. overhead camshaft engine similar in many ways to his engine. I wish to thank him for the assistance he gave me in the early stages.

I drew up plans on the type of engine I had in mind and decided that the crankcase would be the first job. This was made from solid duralumin, all the profile milling being carried out in my 3-in. centre lathe with the aid of a few fixtures. My idea in making the crankcase so complicated was to find out just what type of milling I could carry out with the little equipment I have. This proved very satisfactory and was completed in approximately three weeks of spare time.

I next decided to consider the weight factor, and made the cylinder of duralumin with a KE tool-steel liner hardened and tempered. This was fitted and lapped in position to ensure that distortion did not take place after lapping.

The cylinder-head was made from bronze with twin exhaust ports ; the camshaft brackets are brazed in and bored to take ball-races. The camshaft is rather unorthodox, as I have fitted adjustable cams made from mild-steel case-hardened and pinned to the shaft after positioning. The camshaft was made from nickel chrome-steel and is $\frac{3}{16}$ in. diameter with a flange turned in one end to take the bevel gear. The distributor is fully enclosed, fitted to the end of the camshaft, advancing and retarding being carried out by the distributor case revolving in the ball-race housing of the camshaft. The housing is locked in the camshaft bracket, and the distributor case has elongated slots through which the running bolts pass, giving a good range of advance.

Mr. Dray gave me a pair of 2-1 mitre bevels, one of which I fitted to the camshaft. The vertical drive shaft and case were made from dural. Twin ball - races were fitted to the top and a single ball-race of rather large size to the bottom to ensure that the mitre bevels in the crankcase had a good bearing. I had considerable trouble in trying to get the gears meshed at the crankcase, as these gears cannot be seen. I bored the gears out a tight fit for the vertical shaft and crankshaft and after moving the gears one way and then the other, taking up backlash with shim washers, I managed to get the correct positions. The shim washers were then removed and the gears pinned to the crankshaft and vertical shaft.

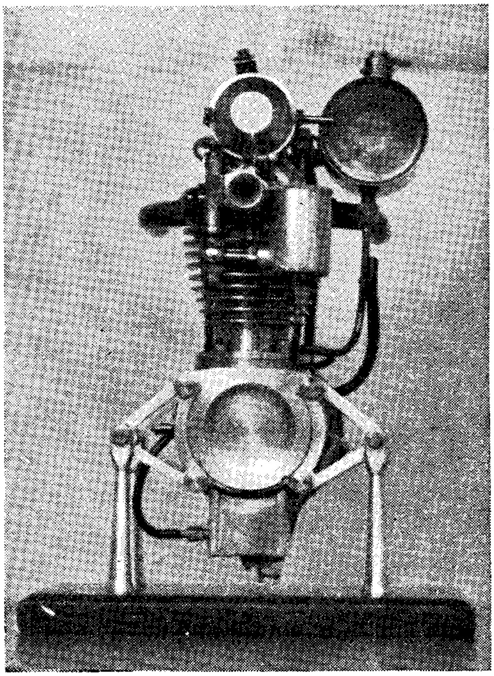
The crankshaft was made from solid nickel chrome-steel, and the connecting-rod of duralumin bronze-bushed at the small- and big-ends. The gudgeon-pin was mild-steel case-hardened $\frac{1}{4}$ in. diameter, the big-end journal being $\frac{3}{8}$ in. diameter. The piston was made from a piece of cast aluminium bar and fitted with two cast-iron rings. The latter gave me considerable trouble, as I found blow holes in the first rings I made, then the next two did not spring very well. In all, I made about eight before patience rewarded me, and I at last had two satisfactory rings.

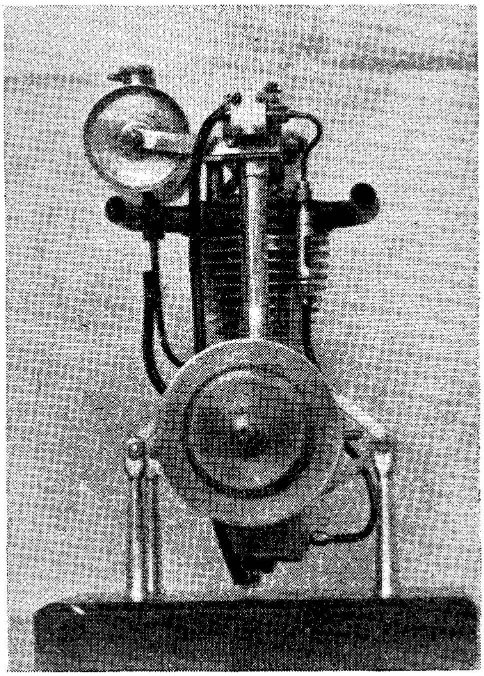
I next fitted all the pieces I had made together to ensure there were no snags, but all was in order. I think I sat and looked at the engine in this stage for nights on end, during which time I decided on the next steps. I made the valves from nickel chrome-steel, and here again I departed from normal design in that I screwed the valve shank and fitted a hardened cup and

lock-nut, which gives me the adjustment, as the camshaft is directly above the valves. I used two spring strips between the valve cup and the cams to ensure good riding.

The valves have 0.06 in. lift, the heads being both $\frac{3}{8}$ in. diameter, and the valve guides are of phosphur bronze. It was at this stage I realised that pressure lubrication was an essential part of an engine of this type, but the problem was where to fit it. I seemed to have slipped in my first plan. The inside of the crankcase was out of the question, so I decide to fit a gear pump to the camshaft. The pump housing and pump were made in one piece and this fits into the bevel gear case at the end of the camshaft. The drive to the pump is a pin and follower to ensure good alignment. I made the sump of brass sheet, soldered and bolted it to the crankcase, cutting a hole through the bottom of the crankcase for an oil outlet to the sump. In the delivery pipe, I put a non-return ball-valve which is incorporated in the banjo union on the sump, to ensure that oil could not drain from the pump. In the crankcase delivery side, I put a glass tell-tale with a ball-valve inside it to enable me to see the oil flow, and also to keep the pump primed. The oil is delivered directly on to the big-end. A control-valve is fitted to bypass surplus oil to the sump, as can be seen quite clearly in the photographs. Although small, the oil pump is very efficient. I fitted a pressure release tube in the crankcase to stop building-up pressure. This can be seen in the photo, fixed to the petrol pipe.

An Atom type R carburettor was fitted. I only had a plan of a 30 c.c. type and no castings, so I decided to prefabricate them, the body from dural and the tubes from brass. A little time was needed before I eventually arrived at the choke tube size. The float chamber is fitted with a metal float made from 0.003 in. brass, spun in the lathe. I felt that a metal float rather than a cork one, was far more in keeping with an engine.





The crankshaft, camshaft and vertical shaft are run in ball-races, seven in all.

After giving the engine a good run-in for approximately four hours in my lathe, it was completely dismantled and cleaned, then reassembled. I had it firing in about ten mins., and after four hours of tuning was getting good response from the carburettor on slow and fast running. After a little alteration to the valve overlap, I clocked 1,500 r.p.m. slow running and 9.300 r.p.m. fast running, thus surpassing anything I had expected to get from an engine of this type. The fast running was under slight load applied to the flywheel with a shoe-brake. More tuning and alterations are required before I shall be satisfied with it, but I feel I have achieved even more than I set out to do. My intention is to fit the engine in a hydroplane when tests have been completed.

The building of the engine has afforded me eight months of complete enjoyment, known only to we model engineers. I should have fitted a ball roller bearing big-end, as I feel the bronze one will not stand up to the r.p.m., but this will not take long to find out, and I shall have learned yet another lesson in design.

Should any reader require further details of this engine, I shall be only too pleased to oblige.

# *Traction Engines not so Well Known

## by Ronald H. Clark, A.M.I.Mech.E.

### XII—C. J. R. FYSON, Mount Works, Soham

A small local firm who, with rather meagre plant and tackle, produced by partial assembly 17 tractions, all very successful !

The boilers were mainly by the Grantham Boiler & Crank Co. Ltd., or Alfred Dodman & Co. Ltd., King's Lynn (see No. VII), and the leading dimensions were as follows :

Inside diameter of barrel 2 ft. 4½ in. Length between tubeplates 5 ft. 3¾ in. Tubes No. 36 × 2 in. diameter × No. 11 s.w.g. thick. W.p. 140 p.s.i. The cylinders and motion were bought from Burrells, of Thetford, but all the other items were made at the little works at Soham.

An interesting feature is the construction of the rear wheels. The spokes fit into recesses cast in the centres and are secured by two ¾ in. taper bolts. The rim or head end of the spoke is welded on to the shank and held to the angle-iron of the rim by three ¾-in. taper bolts with nuts inside the angle. They are driven up tightly with a four-pound hammer, and Mr. Fyson tells me he has never known one work loose. The usual method is to cast the spoke in at the centre and rivet the head end to the rim.

All engines had the letter "T" prefixed to the number thus T1, T2 and so on to T17, and Fig. 27 shows No. T4, and it will be noticed what a good-looking engine it is. The only other unusual feature is the standard flywheel which has curved spokes. All cylinders are 9 in. × 12 in., each engine having two speeds and built upon the three-shaft principle and at a working pressure of 140 p.s.i. In Table V, is given a complete list of the 17 tractions with the year of manufacture. It is interesting, in view of present-day costs, to note that for No. T17 the labour costs were £416 19s. 1d., the material and other costs £516 3s. 5d. making a total work's cost of £933 2s. 6d.

Actually there was one engine turned out some years before No. T1. This was a portable having a single cylinder, the crosshead guides being two

*Continued from page 160, "M.E.," August 4, 1949.

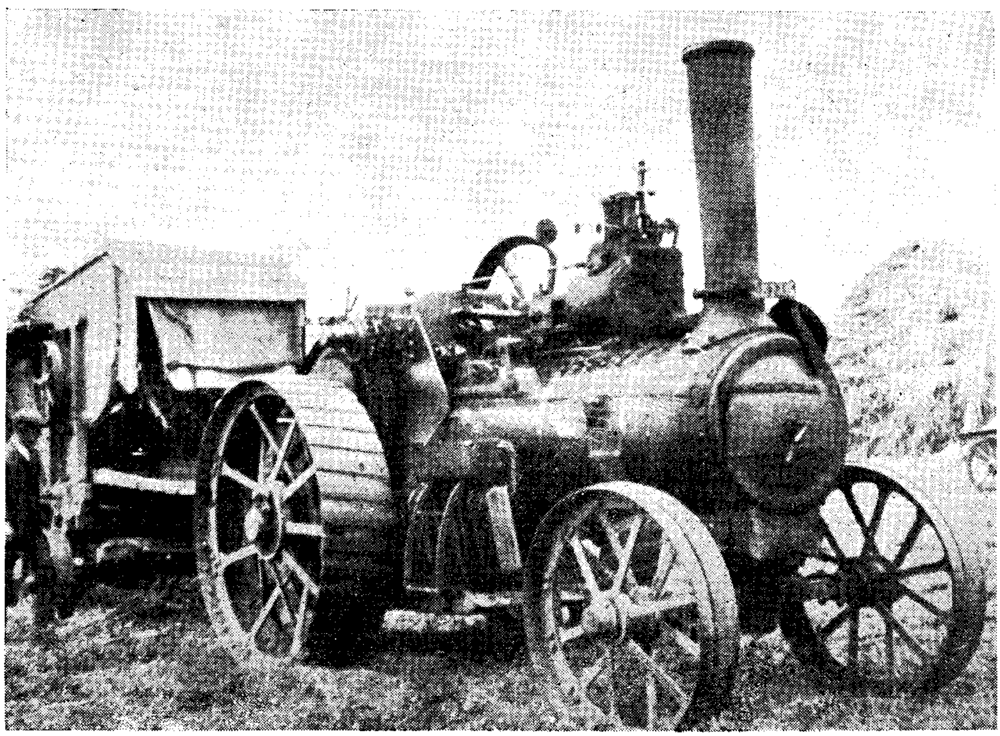


*Fig. 27. Fyson traction engine No. T4 still in use*

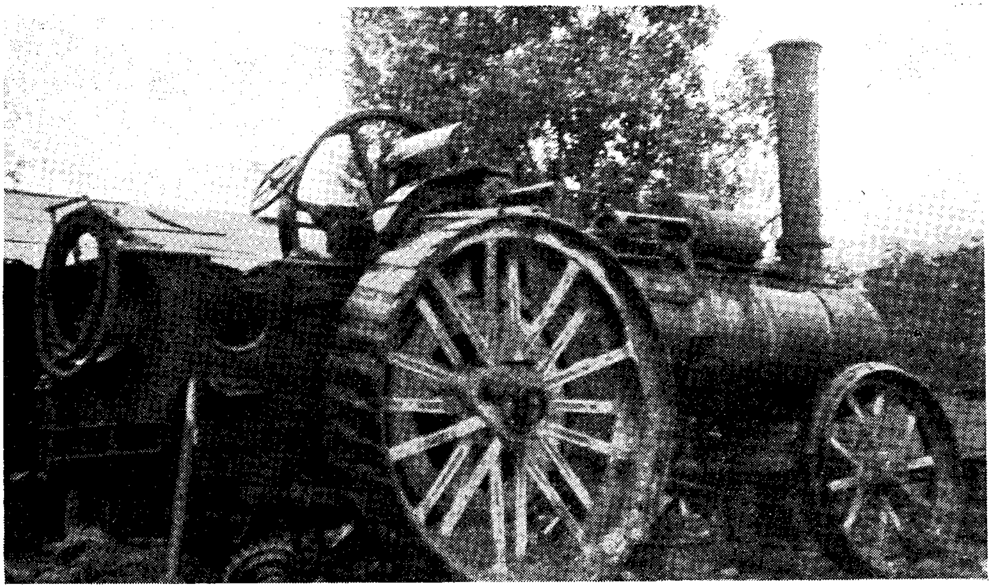


*Fig. 28. 8 n.h.p. traction engine by Harvey & Williams Ltd.*

solid bars $1\frac{1}{8}$ in. diameter, and the boiler was hand-riveted at Soham.

Those interested will find most of these engines still doing good work in the Fen country.

**XIII—Harvey & Williams Ltd., Victoria Foundry, Huntingdon**

A small firm, undoubtedly new to most readers, and who turned out two tractions all told. They were both single-cylinder engines and an elevation of the 8 n.h.p. is seen in Fig. 28, a 7 n.h.p. being the other size made, the cylinder dimensions being $8\frac{1}{2}$ in. × 10 in. for the 7, and 9 in. × 12 in. for the 8 n.h.p. respectively. The working pressure was 125 p.s.i. Both have trunk guides, two speeds with the differential on the right-hand end of the countershaft, the three-shaft layout being used, and the drive is double-geared on the last motion. As in the Fowell engine, the front axle is set well back, giving a short wheelbase and ease in negotiating stackyards, gateways, etc. Stephenson's link-motion is employed with the valve-chest on the left-hand side of the cylinder. The valve-chest cover bears the maker's name and the date cast in relief, thus :

HARVEY & WILLIAMS
LTD.
1900
ENGINEERS
HUNTS.

Note that the county abbreviation only is given as the locality of the firm, the name of the place—Huntingdon—being reserved for inclusion with the maker's name again on the centre of the smokebox door, also cast in relief. This is a late period to find the year of manufacture given, as this practice had died out ten to fifteen years before, hastened by the temptation it offered to the unscrupulous vendor to erase or otherwise "doctor" the date in order to influence the sale to his advantage !

Although not very apparent, the chimney is hinged to the cast-iron base, similar to portable engine practice, but there is no crutch. The boilers were made on the premises. It is

**TABLE V**—List of FYSON Traction Engines

| Work's No. | Year | Remarks |
|---|---|---|
| T1 | 1894 | Gears ex Fowell. |
| T2 | 1895 | |
| T3 | 1898 | |
| T4 | 1900 | See Fig. 27. |
| T5 | 1901 | |
| T6 | 1905 | |
| T7 | 1906 | |
| T8 | 1907 | |
| T9 | 1908 | |
| T10 | 1909 | |
| T11 | 1911 | |
| T12 | 1911 | |
| T13 | 1913 | Rebuilt on new boiler. Other parts off Robey No. 5187. |
| T14 | 1914 | |
| T15 | 1916 | |
| T16 | 1921 (Dec.) | Painted lead ground coat only Jan. 1922. Finished brown April, 1922. |
| T17 | 1924 (May) | |

rumoured that the cylinder castings were made of "borrowed" Fowell patterns and certainly the comparison of Figs. 28 and 25 indicates a striking family likeness confirmed by an inspection of the engines themselves.

The writer saw these two engines at work very recently in excellent condition and still a credit to their builders in a district not usually associated with engineering.

## XIV—Holmes & Sons Ltd., Norwich

Established as far back as 1827, Holmes & Sons produced their first traction engine which won a Silver Medal at Fakenham Show in 1867; from then onwards, various improvements were made, culminating in the straightforward design seen in Fig. 29. Only single-cylinder engines were made, in two sizes of 8 and 10 n.h.p. The gearing of cast steel is arranged for two speeds, giving about 2 and 4 m.p.h. respectively, with the differential on the third shaft, the four-shaft principle being employed. A winding drum with 60 yd. of best wire rope were included, and governing was by means of a two-ball pendulum governor. Other fittings included Ramsbottom safety valves, water lifter, and crankshaft driven feedpump.

It is interesting to note that the list prices in 1890 of the 8 and 10 n.h.p. tractions were respectively £460 and £540.

Holmes & Sons were well known locally for excellent stationary engines, and whilst several of these exist in daily use, the last traction was destroyed in 1939. A high-class finish was given to all their engines, as a study of Fig. 29 will confirm.

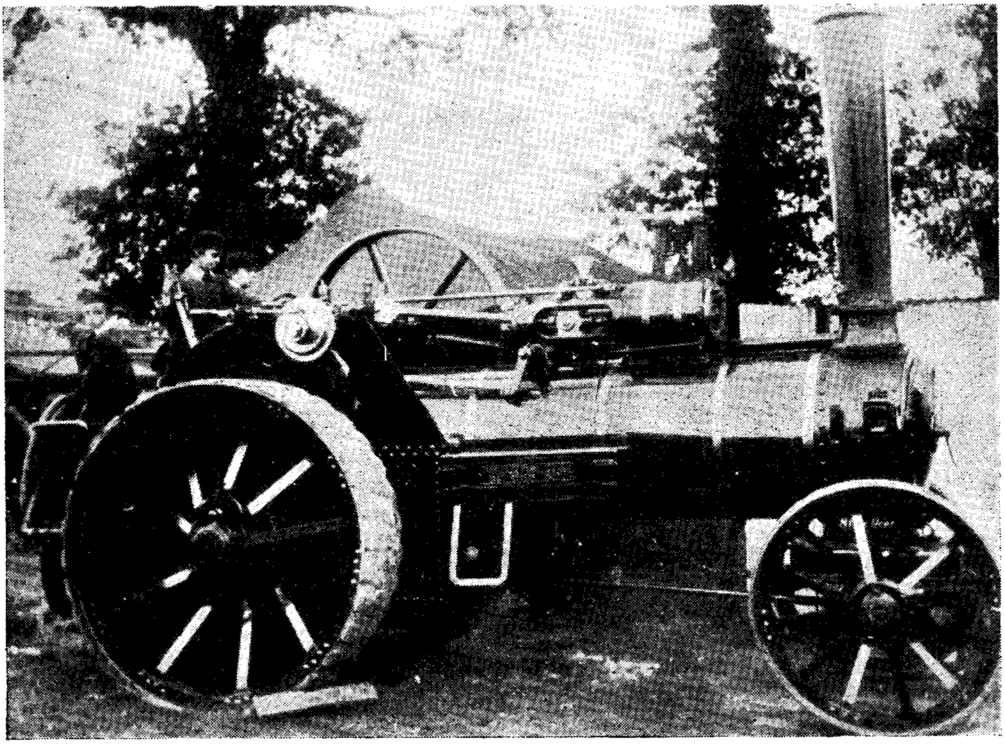


*Fig. 29. A fine traction engine built in the City of Norwich by Holmes & Sons*

## XV—J. & F. Howard & Co. Ltd., Bedford

In later years, until their demise in the chaos of the Agricultural & General Engineers Ltd., Messrs. Howard & Co. were well known for agricultural implements, in particular their ploughs, having not made a traction engine for a number of years.

But this traction was most interesting as well as celebrated, being called by them their "Farmer's Engine," and a photograph of one is reproduced in Fig. 30, from which it will be noticed that the machine is of a very unconventional type, the engine and motion being placed horizontally and behind. Fig. 30 should be studied in conjunction with the line drawing in Fig. 31 depicting a plan of the engine.

A steam dome, as in railway locomotive practice, was placed about half way along the boiler barrel, and was equipped with double Salter safety-valves. Two winding drums were fixed, cantilevered out behind the tender, with the cables led forward and around the deeply grooved guide pulleys, one just in front of the leading axle and two just behind it. The drums

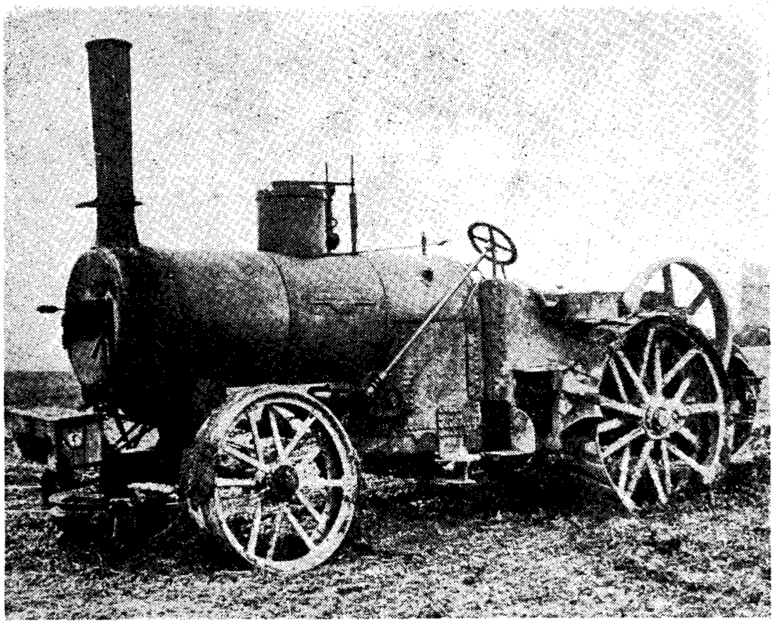


*Fig. 30. Side view of the Howard "Farmer's Engine"*

were driven off a countershaft and could be clutched in or out of gear as desired. Drive to the rear wheels was by another countershaft placed beneath the engine, the final motion to the wheels being via a pinion on the countershaft meshing with a gear-ring fitted to the nearside road wheel, all seen in Fig. 31. The main dimensions of the engine were as follow :

Cylinder 8 in. × 10 in. Flywheel 3 ft. 10 in. diameter. No. of tubes 26 × $2\frac{1}{4}$ in. outside diameter. Heating surface, firebox : $26\frac{1}{2}$ sq. ft. ; tubes $75\frac{1}{2}$ sq. ft. ; total 102 sq. ft. Grate area $4\frac{5}{8}$ sq. ft. Tank capacity 150 gallons. Rear wheels 5 ft. diameter × 16 in. tread. W.p. 120 p.s.i.

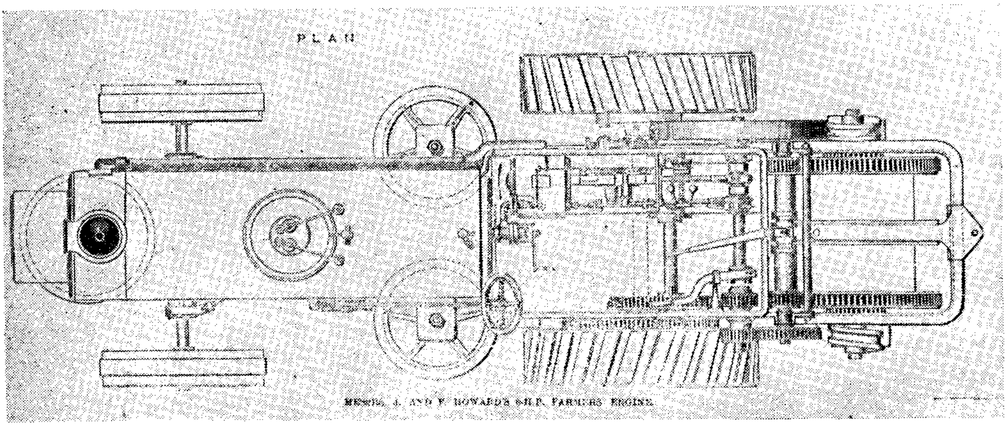



*Fig. 31. Line drawing showing plan of the engine in Fig. 30*

One of these engines, built in 1877, worked for many years in the Fen country and was later, in 1929, run back to the works to be preserved, from Burwell, Cambs under its own steam. Upon the death of the A.G.E. Ltd., in 1932 other interests of foreign origin took over the control of Howards, and, with scant regard to the claims of posterity, destroyed the old engine completely. There may be, however, one or two unknown to the writer.

*(To be continued)*

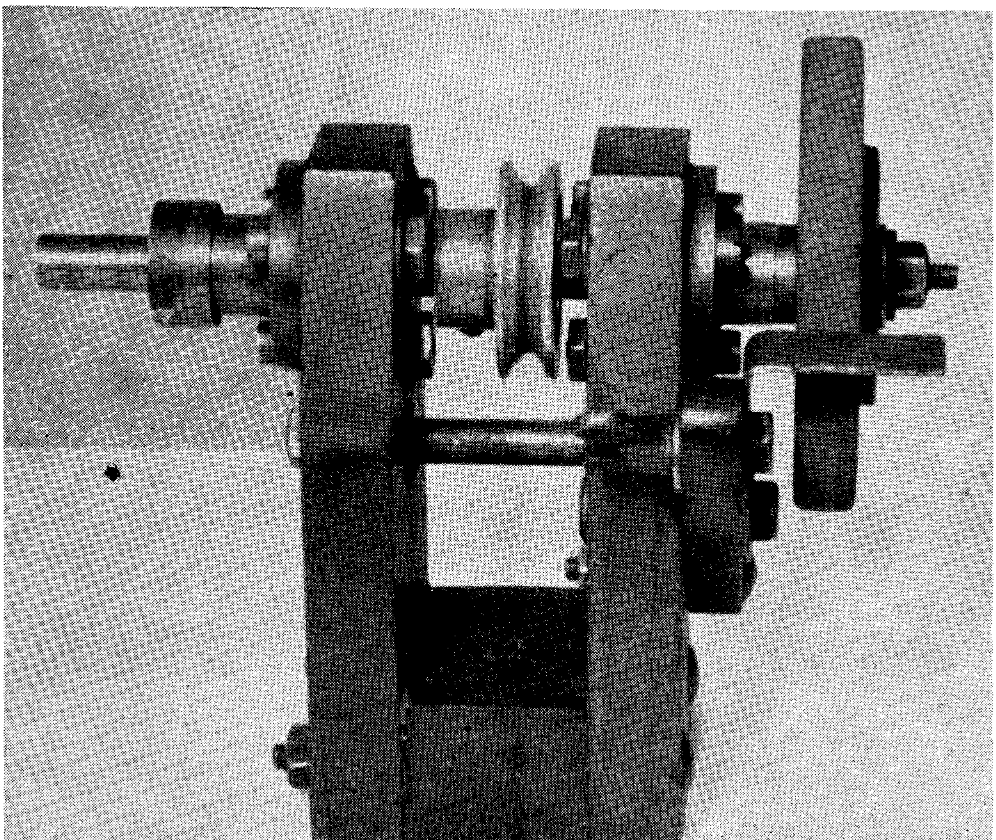
# A SMALL BENCH GRINDER

## by J.K.M.

THE photograph shows a bench grinder which was made many years ago and it occurred to the writer that it has features which may appeal to beginners in model or other light mechanical work. The main requirement here is often for an easily made machine which will grind drills and lathe tools and generally keep the workshop tools in order until a better and more expensive machine can be obtained. Working drawings for the job are shown but these can be modified to suit whatever material is available. It should be noted that where $\frac{1}{4}$-in. diameter holes are shown, they should be made of such a size as to allow a $\frac{1}{4}$-in. "joiners" bolt to pass through easily, but without a lot of play. It will be found that some bolts on the market will do this with holes bored with a $\frac{1}{4}$-in. drill; others require a hole 17/64 in. diameter. This should be checked early on to avoid trouble caused by bolts binding in the holes during assembly.

The main body of the grinder is built up from hardwood—odd bits of oak or mahogany free from knots will do—and thus the problem of machining a large casting does not arise. The wheel itself is 4 in. diameter and $\frac{1}{2}$ in. thick and is mounted on a simple $\frac{1}{2}$-in. diameter spindle on which is fixed a small pulley for $\frac{1}{4}$ in. round leather belt. In its long and somewhat over-worked career the machine shown has been driven by a sewing machine treadle, a heavy Myford lathe treadle and an electric motor, the source of power roughly indicating how some home workshops develop as experience (and the ability to spend money on them) increases.

Referring to the arrangement drawing, the body is built up from two wood sides (1) and a



*The small bench grinder complete*

base (2), also of wood. The sides are secured to the base by means of $\frac{1}{4}$-in. "joiners" bolts and the machine is fixed to the bench by means of a single $\frac{3}{8}$ in. diameter bolt which passes vertically through the centre of the base. This bolt should be fitted with large diameter washers and enable the grinder to be removed from the bench in a few seconds if this becomes necessary. A steel distance piece (3) stiffens up the sides near the bearings (6) which are of cast iron and the spindle (7) passes through holes in the sides which are bored out to give ample clearance. The tools to be ground are supported on an adjustable rest (5) which is fastened to a slotted arm (4) by means of a bolt and wing nut. The arm is fixed to the side by means of two $\frac{1}{4}$-in. bolts and left handed people should assemble the arm and the grinding wheel on the left hand side, and not on the right as shown.

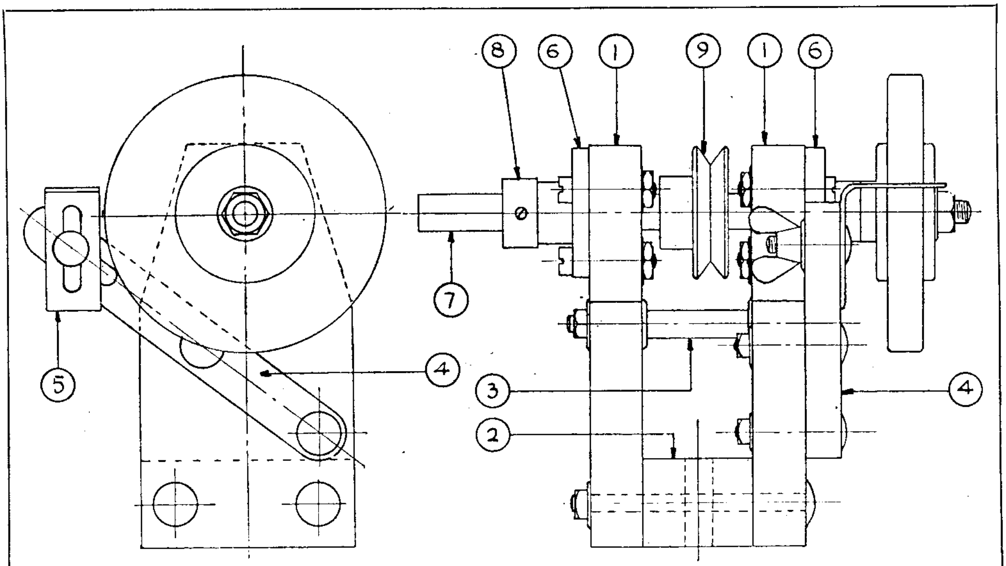



*Fig. 1. Two views showing the general arrangement of the small bench grinder*

## Sides and Base.—Items 1 and 2

After getting the wood to the correct width and thickness, the shape of one side should be marked out and all holes, except those for the bearing bolts, should be accurately located and drilled. The hole at the top is bored $\frac{5}{8}$ in. diameter to let the spindle pass through and the remainder are all drilled $\frac{1}{4}$ in. diameter. The two at the bottom are for the long bolts which secure the sides to the base, the one on the centre line is for the distance piece (3), and the remaining two are for the arm (4). The three holes for the bearing bolts are left until the bearings are finished and ready for assembly.

After one side has been drilled in this way, it should be finished by cutting to shape as shown in the drawing. To drill the second side, the first should be clamped to it and used as a jig so that both pieces will be alike. There is no need, however, to transfer the holes for the arm, since this is required on one side only.

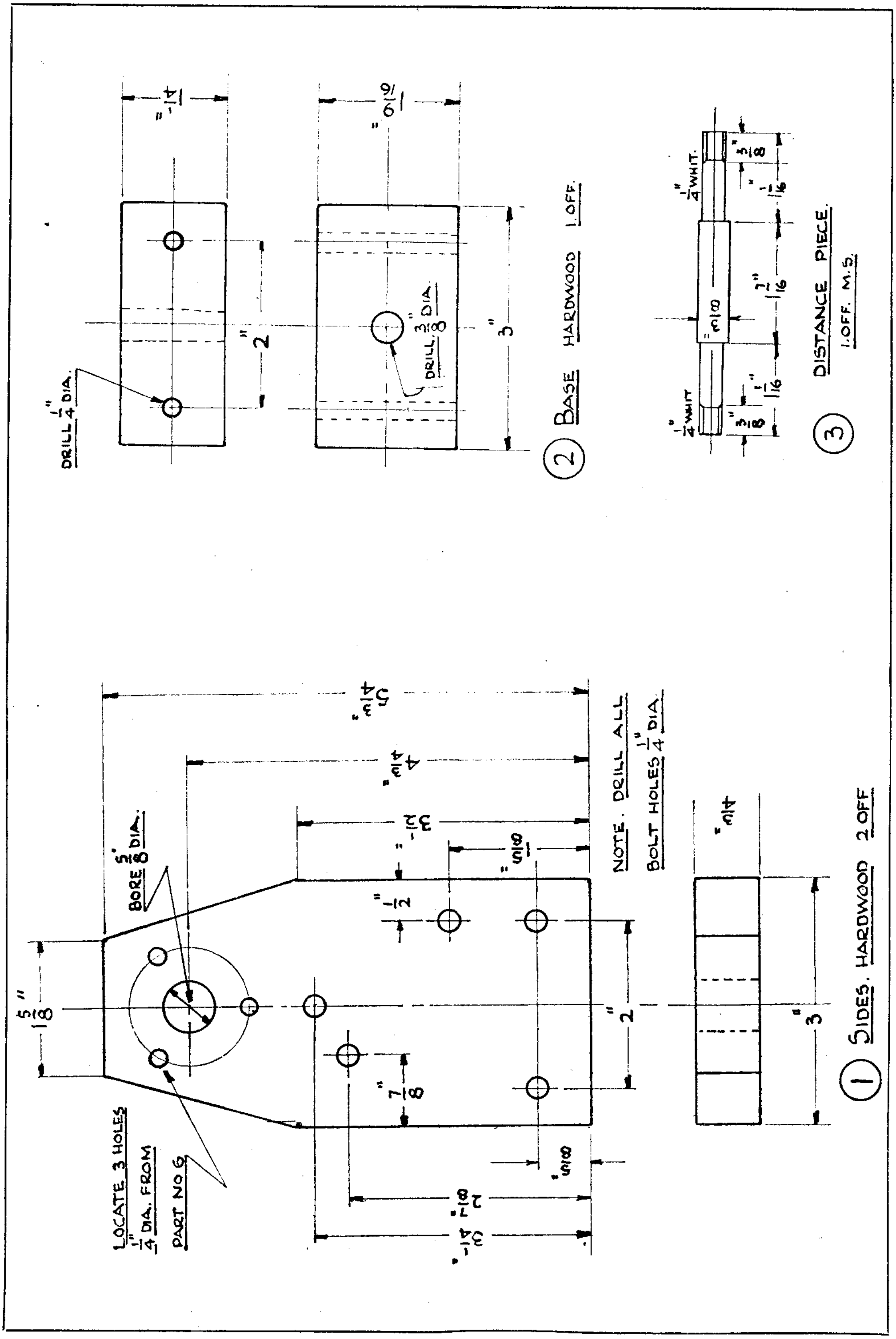
The base (2) is a simple job and the procedure here is to drill the two $\frac{1}{4}$ in. diameter holes, again using the side first drilled as a jig. In this way the long bolts at the bottom will assemble without trouble. This should be verified before going further. The $\frac{3}{8}$-in. hole can then be drilled as shown.

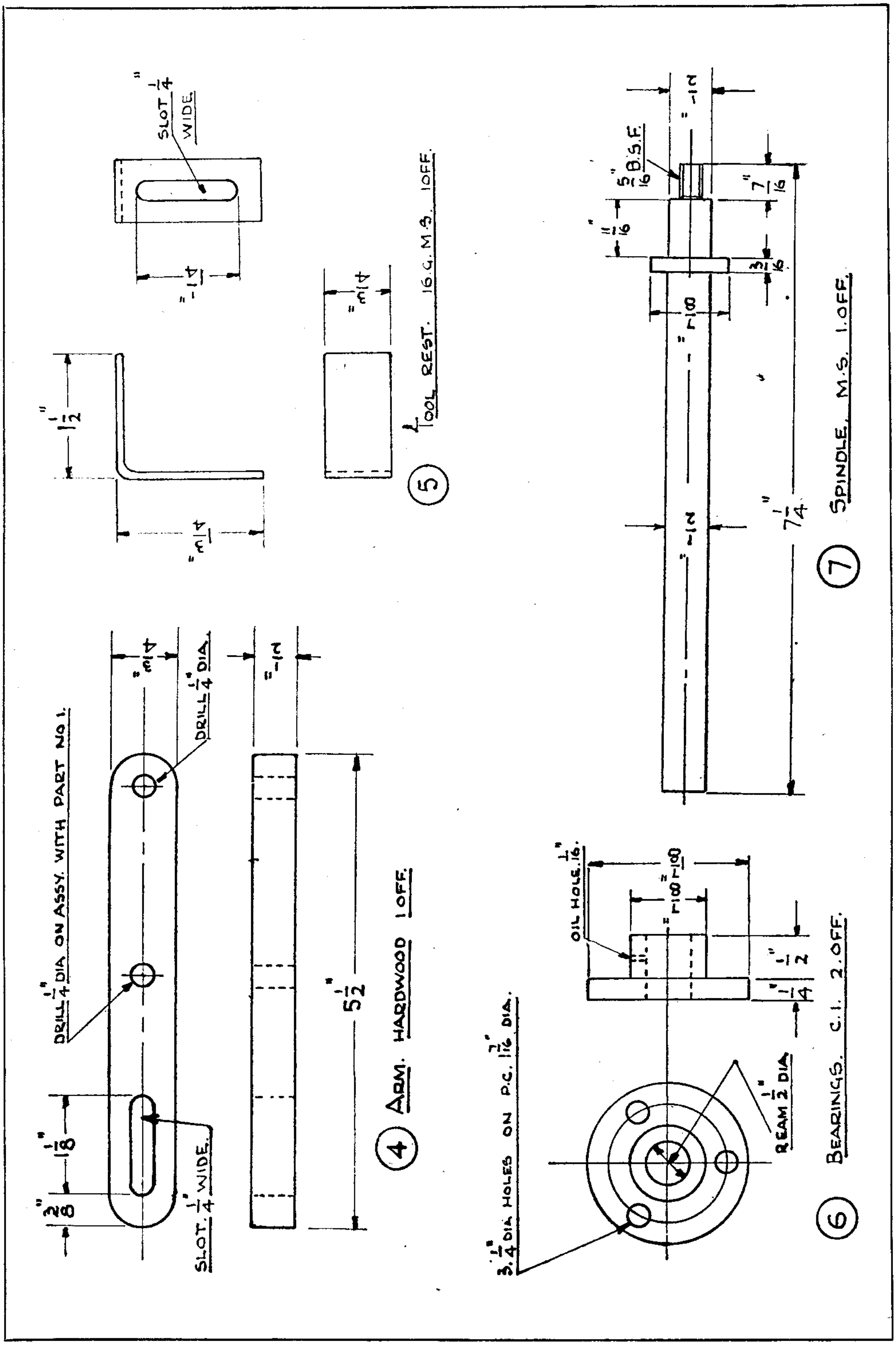
## The Arm.—Item 4

While woodwork is in progress it will be well to complete it by making this part. After planing to width and thickness and marking off to shape, drill holes close together to form the slot, and finish with a chisel (skilled woodworkers will treat this as a "through" mortice and work accordingly). Drill the hole at the other end and then assemble the arm on the side (1), and locate the other hole by passing the drill through the hole already made in the side. The arm can then be permanently fixed to the side by a couple of bolts. Washers should be used to prevent the nuts from sinking into the wood.

## Distance-piece.—Item 3

This is made from a piece of bright steel $\frac{3}{8}$ in. diameter. Hold it in the self-centring chuck, and shoulder down each end to $\frac{1}{4}$ in. and screw $\frac{1}{4}$-in. Whit. for a length of $\frac{3}{8}$ in. Note that the central portion is $\frac{1}{8}$ in. less than the width of the base. This is because a washer $\frac{1}{16}$ in. thick is interposed between the distance piece and the sides, thus bringing the distance between the inside faces of the sides up to $1\frac{9}{16}$ in.


DRILL 1/4" DIA.
DRILL 3/8" DIA.
2 BASE HARDWOOD 1.OFF.
1/4" WHIT.
3 DISTANCE PIECE
1.OFF. M.S.
BORE 5/8" DIA.
LOCATE 3 HOLES 1/4" DIA. FROM PART NO 6
NOTE. DRILL ALL BOLT HOLES 1/4" DIA
1 SIDES. HARDWOOD 2 OFF

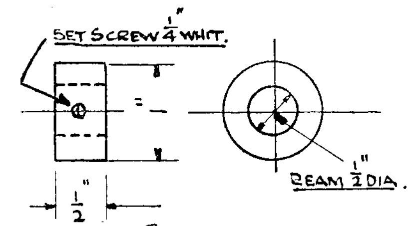

4 ARM. HARDWOOD 1 OFF.
DRILL 1/4" DIA ON ASSY. WITH PART No 1.
DRILL 1/4" DIA.
SLOT 1/4" WIDE.
5 TOOL REST. 16 G. M.S. 1 OFF.
SLOT 1/4" WIDE
7 SPINDLE. M.S. 1.OFF.
5/16" B.S.F.
6 BEARINGS. C.I. 2.OFF.
OIL HOLE 1/16"
REAM 1/2" DIA
3. 1/4" DIA HOLES ON P.C. 1 7/16" DIA.

### Tool rest.—Item 5

This is made from a $3\frac{1}{4}$ in. length of 16-gauge steel, $\frac{3}{4}$ in. wide. Cut the slot first; mark the bend line and bend over at right angles in the vice.

### Bearings.—Item 6

These are a straightforward turning job and cast-iron is specified because it gives a sound bearing surface and long life. Bronze may be used but soft brass should be avoided since wear would be very rapid with this material. The three bolt holes are equally spaced on the pitch circle, which can be marked with a sharp "V" pointed tool while the job is still in the chuck.




8 COLLAR. M.S. 1.OFF.

### Spindle.—Item 7

This is also a plain turning job, but will require careful work to make the long $\frac{1}{2}$ in. diameter a nice, close, running fit in the bearings. The short $\frac{1}{2}$ in. diameter portion should be turned to suit the hole in the centre of the grinding wheel (if a wheel is already available having a bore other than $\frac{1}{2}$ in., this part should be turned accordingly) and it is important that the thread on the end should be true, for if it is not the wheel will wobble when the nut is tightened up. The finished spindle is long enough to project at the left hand bearing so that an emery disc or other fitment can be added. The collar (8) needs no comment except, perhaps, that its grub screw should locate on a small flat filed on the spindle.

### Pulley.—Item 9

This is best made in aluminium alloy, because it will then be easy to machine the "V" groove. On some light lathes this operation can cause trouble when carried out on iron or mild steel. The overall width of the pulley should not exceed $1\frac{1}{16}$ in. to avoid fouling the nuts which hold the bearings in position. As with the collar, the grub screw should locate on a flat filed on the spindle, and this should be attended to during assembly of the machine.

### Assembly

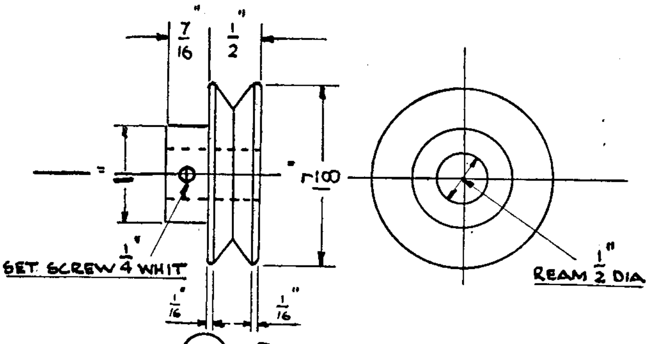
To assemble the parts proceed as follows :—

First attach the distance piece (3) to the side which carries the tool rest arm, and also pass a bolt through the base block (2) for holding the grinder down to the bench. This is important since the bolt cannot be put in after the machine is finished because it would foul the distance piece. Nor is it advisable to assemble the holding-down bolt from underneath. In this case it will be difficult to get a spanner to the nut. Now assemble the base and both sides, checking, at the same time that the $\frac{5}{8}$-in. holes at the top are in line. One quick way to do this is to pass a $\frac{5}{8}$-in. round rod through holes. Don't forget the washers between the distance piece and the sides.

### Easy to Handle

Now fasten the wheel to the spindle using large washers as shown in the arrangement drawing. This will make the spindle easy to handle during the next and final part of the assembly. Clamp the right hand bearing in position making sure that the spindle will be central with the large clearance holes in the sides. Drill the holes for the three bearing bolts and fasten the bearing in position. Thin nuts should be used to give clearance for the pulley. The other bearing is dealt with in the same way, using the spindle as a general guide to alignment. If, after the second bearing has been reserved, the spindle rotates freely, all is well. If the spindle is not free under these conditions, the most probable cause will be that the side pieces are not truly parallel and the remedy is to place paper packing between the side and the distance piece, or the side and the base block. Patient trial and error will finally lead to trial and success.

The driving pulley and collar can now be put on and a small amount of end play in the spindle should be allowed for. Fasten the tool rest to the arm and the job is complete.




9 PULLEY. AL. ALLOY. 1.OFF.

The little machine so made will give years of service. Where possible, it should be run at the speed specified by the makers of the grinding wheel. Often, however, this is not possible especially when it has to be driven from a treadle or from a slowly rotating shaft. Even so, it will do the job, although the wheel may wear more rapidly.